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DOCUMENT

IAQ COMPARISON

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	Acknowledges IAQ Problem	Recommends IAQ Regulation (Standard)	Recommends IAQ Guidelines	Endorsement of Ventilation/ ASHRAE 62-1989	Recommends Mandatory IAQ Evaluations and Reporting Procedures	Suggests Mechanism for Mitigation
AP	X		X	X	X	X
AR	X	X		X	X	
Draft #1	X	X			X	X
Draft #2	X	X		X	X	X
Draft #3		X		X		
AT	X	X		X	X	X

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	Recommends HVAC Maintenance and Monitoring Inspections	Endorses Other ASHRAE Standards and Guidance Documents	Employer/Employee Training in IAQ (Maintenance, etc.)	Addresses Comfort Parameters	Recommends Commissioning of HVAC Systems
AP	X	X			X
AR	X	X			X
Draft #1	X	X	X		
Draft #2	X		X	NO	
Draft #3	X	X	X		X
AT	X	X			

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	Recommends Source Control	Recommends Filtration	Suggests Maximum Constituent Levels	Addresses Smoking	Endorses National Data Center
AP				X	X
AR	NO	X	X	X	
Draft #1					
Draft #2					
Draft #3	NO				
AT		X	X		

Key:

X = endorses
= does not address
NO = opposes

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PARTIAL SUMMARY LISTING OF SOME
ASHRAE SUPPORTIVE SUBMISSIONS

1. State of Wisconsin Department of Industry, Labor and Human Relations (Richard Brandt), Waukesha, Wisconsin, Docket No. 3-10:

"The following statements are characteristics of an ideal building environment or a 'healthy' building. . . . Many of the statements are supported by the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)."

2. Carl E. Sallas, O'Brien & Associates, Inc., San Jose, California, Docket No. 3-219:

"Even in a new building the HVAC system is given a very low priority especially when it comes to 'commissioning' the building before building occupancy. This results in a newly occupied building operating at much less than "design" conditions from the very start. So not only should you be considering the adoption of ASHRAE: 62-1989; but you should be considering ASHRAE 'commissioning' guidelines for BOTH new buildings; and as a periodic (annual?) check on the HVAC system's ability to meet 'design' conditions."

3. Barry Bloom, P.E., Atlanta, Georgia, Docket No. 3-348:

"We base our designs on ASHRAE 62-89 which makes provision for increasing the total outdoor air to a building . . ."

"We are a design firm and apply ASHRAE 62-89 to all new designs."

"If ASHRAE 62-89 is adopted provision should be made for other reasonable methods to be used for determining ventilation rates that will provide safe environments."

4. The Center for Environmental Assessment, Inc. (Antonio F. LaSorte, Jr., CIH), Binghamton, New York, Docket No. 3-418:

"Recommended regulatory components: a) Follow most current ASHRAE standard for fresh air supply to employee work areas. b) Follow most current ASHRAE standard for thermal parameters within all employee work areas."

5. Motor Vehicle Manufacturers Association (Thomas J. Carr), Detroit, Michigan, Docket No. 3-433:

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Attachment B of this submission, by the Ford Motor Company (H.B. Lick), Dearborn, MI, states: "ASHRAE standards preceding ASHRAE 62-1989 that specified 10 cfm outside air per occupant were not sufficient to control the incidence of indoor air quality concerns. ASHRAE 62-1989 specifying 60 cfm outside air per occupant appears to be an effective means of control."

Attachment C, a State of Michigan proposed indoor air quality standard, states: "The provisions of the american society of heating, refrigeration, and air-conditioning engineers [sic] (ASHRAE) Standard 62-1989 entitled "Ventilation for Acceptable Indoor Air Quality,' are adopted by reference in these rules only as they apply to occupied workplaces covered by these rules."

6. Food and Allied Service Trades Department, AFL-CIO (Keith R. Mestrich), Washington, D.C., Docket No. 3-434:

"A building systems approach based on the ASHRAE ventilation standard would be the most effective way for OSHA to regulate the problem of indoor air quality and bring relief to workers suffering from this insidious form of occupational illness."

This submission also includes a New Jersey Department of Health fact sheet on indoor air quality (Appendix B) which states: "Fresh, outdoor air should be adequately distributed to all office areas during the entire time they are occupied, at a minimum rate of 20 cubic feet per minute (cfm) per person. This level is specified in the latest draft of American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) Standard 62, 'Ventilation for Acceptable Indoor Air Quality", for office areas."

7. ASHRAE (Charles R. Miró), Washington, D.C., Docket No. 3-440 (attachment, 1991 ASHRAE statement to Congress):

"ASHRAE recommends Standard 62-1989 as the standard of choice for adoption by reference for state and local building codes and regulations."

Attachment, ASHRAE Indoor Air Quality Position Statement: "ASHRAE Standard 62, the comprehensive ventilation standard should be widely disseminated and referenced by state and local building codes."

8. New York State Public Employees Federation, AFL-CIO (Jonathan D. Rosen), Albany, New York, Docket No. 3-444:

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An attachment, testimony to New York Assembly by James Melius of New York State Department of Health, states: "The most recent standards from the American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE) provide generally sound guidance for the ventilation of buildings. In general, the ASHRAE recommendation of 15 to 20 cubic foot of outdoor per minute per occupant provides adequate air exchange to prevent these symptoms and can be utilized as a guide for maintaining adequate ventilation in a building."

9. American Federation of State, County and Municipal Employees, AFL-CIO (C. Denise Bland-Bowles), Washington, D.C., Docket No. 3-446:

Attachment A, "AFSCME Fact Sheet: Indoor Air Pollution," states: "Common solutions include: . . . Increasing ventilation rates. The National Institute for Occupational Safety & Health and the American Society of Heating, Refrigerating [sic] and Air Conditioning Engineers recommend minimum rates per occupant of at least 20 cubic feet per minute in areas where smoking is allowed and at least 5 cubic feet per minute in non-smoking areas."

10. Ford Motor Company (H.B. Lick), Dearborn, Michigan, Docket No. 3-447:

"ASHRAE standards preceding ASHRAE 62-1989 that specify 10 cfm outside air per occupant are not sufficient to control indoor air quality concerns. ASHRAE 62-1989 specifying 20 cfm outside air per occupant appears to be a more effective means of reducing IAQ concerns."

Ford also appends the State of Michigan proposed indoor air quality standard, and states that it "is relatively short and keys on ASHRAE 62-1989."

11. Sharon D'Orsie, Elizabeth Cunningham, Eagle Env. Health, Inc., Houston, Texas, Docket No. 3-500:

"General industry standards for design and operation of HVAC systems are those developed and published by ASHRAE. These consensus standards were revised in 1989 to reflect growing IAQ concerns (ASHRAE 62-1989)."

"Although there are no identified studies verifying the acceptability of the IAQ following ventilation system adjustments, it appears that meeting ASHRAE standards would eliminate the majority of IAQ complaints related to ventilation."

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12. Terracon Environmental (David Beem), Kansas City, Missouri, Docket No. 3-501:

In response to question 92: "Ventilation requirements with specifics on air velocity, air volume and air changes. In addition, specifics on the amount of fresh air needed per person for specific operations, such as listed in ASHRAE 62-1989, Ventilation for Acceptable Indoor Air Quality."

13. Dow Chemical Company (Richard Olson), Midland, Michigan, Docket No. 3-502:

"The American Society for Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) standard 62-1989 should be utilized as a basis for the provision of adequate air exchange and ventilation."

14. 3M (C. John Hodgson), St. Paul, Minnesota, Docket No. 3-509:

"Moreover, there already exists many guidelines and standards, e.g., ASHRAE 62-1989, that address IAQ issues, including detailed procedures for investigating and controlling IAQ problems."

15. Edward J. Pajneuf, Executive Director, American Federation of Teachers, Pembroke, New Hampshire, Docket No. 3-522:

"We would like to see the schools in our jurisdiction adhere to the ASHRA [sic] standards on clean indoor air because of the threat posed to students and staff members by toxic air."

16. David J. Schlein, 14th District National Vice-President, American Federation of Government Employees, AFL-CIO, Washington, D.C., Docket No. 3-529:

"[A]n ongoing system for IAQ control and preventive maintenance. This entails establishment of general standards, worked out by OSHA, using ASHRAE guidelines as one of the criteria, for the safe operation and upkeep of H/VAC systems and ventilation."

17. Milton H. F. Saul, Assistant Commissioner, State of Maryland, Occupational Safety and Health, Baltimore, Maryland, Docket No. 3-531:

"Based on our experience, the vast majority of buildings, in which employees are complaining, present evidence of inadequate ventilation (i.e. not meeting ASHRAE 62-1989), poor smoking policy (i.e. either no restriction, or inadequately ventilated smoking areas or lounges), or both."

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In response to question 92: "provision of outside air as close to ASHRAE guidelines as possible."

18. John R. Cammidge, Vice-President, Bank of America, San Francisco, California, Docket No. 3-552:

In response to question 45: "ASHRAE ventilation standards are followed."

"Indoor air quality standards should include the following elements: ASHRAE recommendations...."

19. Douglas M. Brugge, Industrial Hygienist/Labor Educator, Massachusetts Coalition for Occupational Safety and Health, Boston, Massachusetts, Docket No. 3-612:

"I have worked with several unions in an on-going way to help them resolve indoor air problems faced by their workers, as well as leading numerous courses and workshops in indoor air quality. Based on this experience, we believe that the current ASHREA [sic] standard (#62-1989) or other stricter regulations should be adopted as law. Enforcement of a law based on the ASHREA [sic] standard will solve a great number (but not all) indoor air quality problems."

20. Donald H. Bowman, Senior Industrial Hygienist, Ball Corporation, Muncie, Indiana, Docket No. 3-646:

In discussing an investigation into employee complaints about poor indoor air quality, Bowman writes that the solution was to install "fresh air makeup systems to introduce the American Society of Heating and Refrigeration Engineers (ASHRE) [sic] recommended 20 cfm per person."

21. George R. Phelps, North American Insulation Manufacturers Association, Alexandria, Virginia, Docket No. 3-647:

"Regarding ASHRAE standard 62-1989, it is NAIMA's position to fully support the application and usage of this Standard. It represents the consensus of the industry as to the best available standard of practice to avoid IAQ incidents."

22. Howard Egerman, American Federation of Government Employees, Oakland, California, Docket No. 3-648:

"We try to encourage management to follow ASHRAE Standard 62-1989." "I believe strongly in the ASHRAE standard and feel that all SSA offices should have signs reading 20 cfm/person." "I feel pure and simply that OSHA must adopt

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the ASHRAE standards for controlling occupational exposure to indoor air contaminants simply because managers are not going to do anything if they are told it is voluntary." "We must rely on experts such as ASHRAE to lead us. Their standards are quite good."

23. Gershom Meckler, Gershon Meckler Associates, Herndon, Virginia, filed:

"Perhaps it would be appropriate to legislate some minimum standards similar to those published by ASHRAE."

24. Theodor Sterling, Theodor D. Sterling and Associates, Ltd., Vancouver, British Columbia, Canada, filed:

"Following the standard should alleviate most IAQ problems for which causes have been identified" and "should provide appropriate ventilation rates to control PTS."

25. Healthy Buildings International, Inc., Fairfax, Virginia, Draft Statement:

"[O]ur experience and data show that buildings ventilated in compliance with ASHRAE 62-1989 can accommodate moderate amounts of smoking with minimal discomfort and health impact." They state that "we support its continued development and incorporation into future building codes, standards and IAQ legislation." Their response to question 92 includes the recommendation to "embrace and enact every aspect of" ASHRAE 62-1989.

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AT

PROPOSED OSHA INDOOR AIR QUALITY STANDARD

Section 1. Definitions

A. "ASHRAE" refers to the American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.

B. "Occupied spaces" means those spaces in office buildings where employees spend significant portions of the workday. Occupied spaces include, but are not limited to, offices, lounges, waiting rooms and reception areas, conference rooms, and office cafeterias. Occupied spaces do not include kitchens or restrooms.

C. "Occupied zone" means the region within an occupied space between planes 3 and 72 inches above the floor and more than 2 feet from the walls or fixed air conditioning equipment.

D. "Office building" includes any non-industrial building the primary purpose of which is to accomodate employees and excludes any commercial establishment designed primarily to accomodate the general public, regardless of whether such an establishment is located within a structure the other parts of which constitute an office building. Commercial establishments designed primarily to accomodate the general public include, but are not necessarily limited to, hotels, restaurants, bars, retail stores, beauty shops, laundries and dry cleaners, casinos and game rooms.

E. "Sick building syndrome" refers to the acute set of symptoms associated with occupational exposure to poor indoor air quality or inadequate ventilation. Such symptoms include headaches, fatigue, eye, nose and throat irritation, and upper respiratory complaints.

F. "Significant renovation" means

i. a single renovation the contract value of which exceeds fifty percent of the market value of the building; and

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ii. multiple renovations initiated within any two-year period the combined contract value of which exceed fifty percent of the market value of the building.

Section 2. Ventilation Requirements for Newly-Designed or Newly-Renovated Office Buildings and for Other Office Buildings When Feasible

A. This Section applies to the following buildings:

i. any office building for which construction designs are drafted on or after the effective date of this Standard;

ii. any office building upon which significant renovations are initiated on or after the effective date of this Standard; and

iii. any other office building that feasibly is able to comply with this Section.

B. Any office building covered by this Section which, during the course of any year, is the subject of complaints by more than twenty percent of its employees of symptoms associated with sick building syndrome after compliance with this Section must also comply with Section 3.

C. The occupied zone in occupied spaces in any office building subject to this Section must be ventilated with adequately filtered outdoor air at the rates specified in ASHRAE Standard 62-1989.

D. Employers must verify compliance with the ventilation rates required by subsection C either by

i. measuring on a regular and consistent basis or otherwise controlling carbon dioxide levels in the occupied zone in occupied spaces at less than 1000 ppm; or

ii. directly measuring air flow rates in the occupied zone in occupied spaces at the rates required by subsection C on a regular and consistent basis.

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E. The ventilation system in any office building subject to this Section must be equipped with air filters that comply with ASHRAE Standard 52-76 (Average Atmospheric Dust Spot Efficiency Standard) and that clean both outdoor and recirculated indoor air.

Section 3. Requirements for Other Office Buildings

A. This Section applies to any office building designed or constructed prior to the effective date of this Standard that cannot comply with Section 2 without significant modifications to its existing ventilation system or construction design.

B. Any office building subject to this Section must maintain concentrations, in the occupied zone in occupied spaces, of the following contaminants at or below the levels indicated:

i. Carbon dioxide -- 1.8 g/m3 (1000 ppm) (continuous)

ii. Carbon monoxide -- 40,000 µg/m3 (9 ppm) (8-hour average)

iii. Chlordane -- 5 µg/m3 (3 ppb) (continuous)

iv. Nicotine (as a marker for environmental tobacco smoke) -- 50 µg/m3 (8-hour average)

v. Nitrogen dioxide -- 100 µg/m3 (0.055 ppm) (1-year average)

vi. Ozone -- 100 µg/m3 (0.05 ppm) (continuous)

vii. Radon -- 0.027 WL (1-year average)

viii. Sulfur dioxide -- 365 µg/m3 (0.14 ppm) (24-hour average)

ix. Total particulates -- 260 µg/m3 (24-hour average)

C. Compliance with this Section may be accomplished through any reasonable combination of ventilation, filtration, air cleaning, and occupied space reallocation or redesign.

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D. Employers in control of any office building subject to this Section must verify compliance with the requirements of this Section at least once annually.

Section 4. Inspection Requirements

A. The air handling equipment of any office building subject to this Standard must be inspected on an annual basis. In the course of such an inspection, at a minimum the following components of the air handling equipment must be examined and, when necessary and appropriate, cleaned, drained, repaired or replaced:

i. all internal chambers, including the insulation thereof;

ii. all coils and drain pans;

iii. all air supply ducts;

iv. all humidifying equipment; and

v. all filters.

Section 5. Recordkeeping

A. Employers must establish and maintain a written record of all measures taken to ensure compliance with each of the requirements of this Standard. At a minimum, the record must include

i. all employee complaints of symptoms associated with sick building syndrome and the dates on which the complaints are received;

ii. where applicable, all measurements made to ensure compliance with Sections 2 and 3 and the dates on which such measurements are made;

iii. where applicable, all efforts made to ensure compliance with subsection E of Section 2 and the dates on which such efforts are made; and

iv. all inspections conducted pursuant to Section 4, including the dates on which

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such inspections are made and the corrective actions taken following such inspections.

B. Employers must maintain any records made pursuant to this Section for a minimum of five years.

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AP

Question (92) If OSHA determines, on the basis of adequate evidence, that regulatory action is needed to protect employees from adverse health effects related to indoor air quality, what elements do you believe such regulation should include? Please provide the basis for your suggested element(s).

Reply:

Our review of the scientific data indicates that typical exposures to PTS in the workplace are minimal (see PM Replies to RFI, #'s 24, 35-28), that PTS plays a minor role in "sick-building syndrome" (See PM Reply to RFI #3) and that ventilation rates prescribed in one consensus standard (ASHRAE 62-1989) are adequate for the maintenance of acceptable indoor air quality in general, including the dilution and removal of PTS and other indoor air constituents (See PM Reply to RFI, #'s 49, 62, 66, 71). These data suggest that a focus on PTS in an attempt to address poor indoor air quality would be misdirected and inadequate. Prohibition of smoking would not, for example, affect indoor air quality problems in 96-98% of sick buildings investigated to date.

Should the need for regulatory action on indoor air quality be determined by OSHA, it would be advisable to frame measures in the broadest possible terms, thereby relegating ultimate decision, control and implementation to employers and the

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employees in the indoor environment. This general approach has been suggested recently by Dwight Lee in a 1991 publication. In his review, Lee provides recommendations for proposed regulatory action on indoor air quality.[1] He writes:

> If political decision makers determine that indoor pollution levels are excessive in the absence of government action, then the goal should be to reduce that pollution to acceptable levels and to do so at least cost. Assume, for example, that the government has determined that indoor air quality in all commercial establishments, workplaces, and buildings open to the public should meet some specified standard. After the government establishes such a standard, for government policy then to impose specific abatement procedures on those responsible for indoor pollution levels would not be efficient. Instead, efficiency requires that the procedure for satisfying the indoor air quality standard be determined by those who -- as residual claimants (either private owners or public managers) -- possess the greatest information and motivation so as to satisfy that standard at least cost.
>
> If one has the flexibility to meet indoor air quality standards at least cost, then a variety of responses surely will occur. In some cases, of course, the response will involve restricting cigarette smoking. But such restrictions will not likely be the only -- or even the most important -- means of improving indoor air quality. One can expect that restricting everything from the type of new carpet installed to the location of office supplies will play a role in reducing indoor air pollution in the most efficient manner. And in nearly all cases, restricting items and activities will be complemented -- if not eliminated -- by paying attention to installing and maintaining proper ventilation systems.

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> . . . if government policy established an indoor air quality standard, then no justification exists for government restrictions on smoking. To the extent restrictions on smoking are an appropriate response to the problem of indoor pollution, they will be imposed more efficiently by those with the most information and motivation to meet the indoor air quality standard at least cost.

OSHA is urged, if the need for regulation and/or guidelines on indoor air quality is demonstrated as a result of the RFI process, to develop a comprehensive but flexible approach to total indoor air quality in the workplace. To that end and consistent with OMB Policy Directive A-119, OSHA should look to already existing consensus standards and guidelines on indoor air quality.

In so doing, OSHA should therefore consider the following regulatory perspectives:

(1) OSHA should consider the ventilation rate provisions prescribed in ASHRAE Standard 62-1989 ("Ventilation for Acceptable Indoor Air Quality") as minimum ventilation rates in indoor workplace environments. These ventilation rates were specifically designed to address potential complaints about indoor air

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quality. Consistent with these guidelines, reasonable smoking in the workplace can be accommodated and in those instances where smoking lounges are utilized by an employer to assist in accommodation, they should meet the requirement of ASHRAE 62-1989.

(2) OSHA should consider an HVAC operational requirement that HVAC systems shall be operated continuously during working hours except during emergencies, repairs or in such other circumstances as identified by OSHA.

(3) OSHA should consider the provisions of ASHRAE Standard 52-76 for guidance on proper air filtration techniques and applications.

(4) OSHA should consider the provisions of ASHRAE Standard 55-1981 for guidance on proper temperature and humidity ranges.

(5) OSHA should consider a requirement for periodic inspection, maintenance and monitoring of HVAC

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systems to assure proper operation, efficiency, general hygiene, and bioaerosol control.

(6) OSHA should consider requiring procedures for employer's response to, and resolution of, indoor air quality complaints.

(7) OSHA should consider requiring employers to maintain acceptable indoor air quality during periods while work is being performed on the workplace facility such as remodeling, reroofing, painting and similar activities.

(8) OSHA should consider a requirement addressing unique problems associated with new buildings being occupied for the first time. If ASHRAE establishes or promulgates commissioning guidelines, OSHA should, pursuant to OMB Policy Directive A-119, consider the application of the then-existing ASHRAE commissioning guidelines relating to indoor air quality.

(9) In those instances in which an existing building's HVAC system has been designed such that it is

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incapable of delivering recommended ASHRAE ventilation rates, employers should be encouraged by OSHA to use reasonable heating, air conditioning and ventilation techniques to improve or enhance ventilation, short of a total renovation of the HVAC system. In any case, existing systems should be operated at design maximums to bring ventilation rates as close to ASHRAE 62-1989 as the design will allow.

(10) OSHA should consider requiring that when substantial renovation or alteration of either the building or the HVAC system is undertaken, the HVAC system should be updated so as to provide at least the minimum ASHRAE ventilation rates specified in the currently existing version of 62-1989.

On an annual basis, OSHA should sponsor and present an OSHA indoor air quality program to treat and address current issues relating to indoor air quality in the workplace. Efforts should be made to coordinate the timing and presentation of the program with the annual meeting or mid-winter meeting of ASHRAE so as to further foster coordination between private sector consensus standards and OSHA regulation of indoor air quality, all toward the

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end of improving indoor air quality at current or reduced operating costs.

OSHA should explore with ASHRAE, the Department of Energy, NIOSH and the Environmental Protection Agency, the establishment of an Indoor Air Quality, National Data Center that would accept and maintain data relating to indoor air quality investigations conducted in any building falling within the regulatory measures and jurisdictional purview of OSHA.

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REFERENCES

1. Lee, D. "Environmental Economics and the Social Cost of Smoking," Contemporary Policy Issues 9(1): 83-92, 1991.

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Question (92). If OSHA determines, on the basis of adequate evidence, that regulatory action is needed to protect employees from adverse health effects related to indoor air quality, what elements do you believe such regulation should include? Please provide the basis for your suggested elements(s)?

The difficult scientific, policy and legal issues that OSHA must address whenever it decides whether and how to regulate an occupational health hazard are magnified considerably with respect to the issue of indoor air quality. Critical questions concerning the particular health effects associated with workplace exposures to indoor air contamination, the magnitude of workplace exposures to indoor air contamination and the quantification of risks associated with workplace exposures will challenge OSHA's ability to assemble and evaluate often incomplete or ambiguous scientific data and reach conclusions that conform to the legal requirements for the the promulgation of standards under the Occupational Safety and Health Act.

An obvious but important complication for OSHA as it seeks to evaluate evidence, reach valid conclusions and make rational decisions about the appropriateness of regulation is the fact that indoor air contamination and the adverse health effects associated with it are caused by a highly variable amalgam of

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chemical and biological agents from multiple sources, and also may be affected by a variety of physical agents and other factors.

In recognition of these challenges associated with the determination of whether to regulate indoor air contamination, and in keeping with its recent approach to regulating health hazards, OSHA itself has suggested two strategies for addressing indoor air problems. First, it has preliminarily decided to treat the issue of indoor air contamination in a single, "generic" or "comprehensive" rulemaking that takes a "broad scope approach" to the prevention of "a wide range of adverse health effects linked to overall workplace indoor air quality." Secretary's Response to the Court's Order for Further Submissions at 10-11, Action on Smoking and Health v. Occupational Safety and Health Administration ("ASH v. OSHA"), D.C. Cir. Nos. 91-1037, 1038. Second, OSHA is looking at the "development of common control strategies effective against an array of significant toxic health threats." Id. at 11.

Should OSHA decide to develop a proposed standard that addresses indoor air quality issues, RJR strongly endorses the development of a comprehensive standard directed at the generic issue of indoor air quality and incorporating the use of common control strategies to address the issue. More particularly, OSHA should consider developing a proposed standard that would incorporate the following basic elements:

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(1) Each covered workplace shall be ventilated with outdoor air at the rates specified in ASHRAE standard 62-1989 where (a) the HVAC system servicing that workplace is capable of delivering those specified rates or (b) adjustments to the HVAC system to allow the delivery of those rates are feasible. (Note: Define "adjustments.")

(2) The HVAC system of any building for which construction designs are finally approved by a [competent authority] on or after the effective date of the standard and which is designed or is expected to contain a covered workplace shall be operated in accordance with section (1).

(3) Where the HVAC system is not capable of delivering the rates specified in ASHRAE Standard 62-1989 or where feasible adjustments to the system do not allow delivery of those rates, the HVAC system shall be operated at ventilation rates for outdoor air in accordance with its design capacity [specifications?], including feasible adjustments to increase such capacity.

(4) For workplaces covered under section (3), each employer shall perform an initial worksite assessment to determine the adequacy of the indoor air quality, which shall include monitoring for at least the following contaminants: CO_2, CO, NO_2, Ozone, RSP. If the results of the initial survey show levels in excess of [specified levels], the employer shall take steps to maintain indoor air quality by

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achieving the specified levels through such means as additional ventilation, filtration, air cleaning and space reallocation or redesign. If the initial survey results are below the specified levels, additional monitoring shall be undertaken if modifications to the workplace are made that may affect indoor air quality. Employees shall be informed of monitoring results that exceed the specified levels and of modifications being made to the workplace that may affect indoor air quality.

(5) Each HVAC system servicing a covered workplace must be equipped with air filters that comply with ASHRAE Standard 52-76 and that clean both outdoor air and recirculated indoor air.

(6) A program for the periodic inspection and maintenance of each HVAC system servicing a covered workplace shall be established and implemented to minimize the build-up and circulation of biological and other contaminants.

(7) If construction, reconstruction, renovation, repair or modifications are to be performed in a building that may affect the indoor air quality of a covered workplace within that building, materials and processes shall be used that will reduce the risk of exposure to employees in the covered workplace to contamination from the activities associated

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with the project. Potentially affected employees shall be informed of the project and of the steps being undertaken to reduce the risk of indoor air contamination.

As the evidence presented to OSHA will unequivocally demonstrate, the steps outlined above will substantially reduce the risk of adverse health effects from indoor air contamination and eliminate any significant risk of harm from poor indoor air quality.

[Further discussion.]

Adoption by OSHA of this generic approach to indoor air quality concerns will achieve the benefits and eliminate the considerable burdens of undertaking a series of rulemakings seeking to evaluate risks and develop appropriate control measures for each of the various individual contaminants that contributes to poor indoor air quality. As OSHA aptly points out, its policy preference for generic standards is firmly based on its determination that a "substance-by-substance" approach to the regulation of occupational health hazards has not and will not fulfill the congressional mandate to protect workers from the wide range of adverse health effects confronted by American workers. OSHA specifically acknowledges the particular suitability of a "comprehensive indoor air quality rulemaking [that] may permit the development of common strategies effective against an array of significant toxic health threats." The Secretary's Response at 11, ASH v. OSHA,

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supra. OSHA has most recently adopted this generic approach to the regulation of health hazards based on the use of common control strategies in its standard on Bloodborne Pathogens, published on December ___, 1991, 55 Fed. Reg. ___. Just as the adoption in a single standard requiring the use of universal precautions and barrier practices will prevent exposure to numerous varieties of bloodborne pathogens, so the adoption of recognized ventilation operation and maintenance practices will substantially reduce the risks associated with exposure to a wide variety of indoor air contaminants.

The reasons justifying the development of a ventilation-based generic standard covering all indoor air contaminants apply with equal force to the regulation of passive tobacco smoke. RJR recognizes that among the principal catalysts for the consideration by OSHA of an indoor air quality standard has been the persistent efforts of anti-smoking advocates to persuade (and compel) OSHA to ban smoking in the workplace. There is neither a scientific nor a legal basis for such a draconian measure.

For OSHA to justify the issuance of any regulatory requirements specific to passive tobacco smoke, it would have to demonstrate the existence of a significant risk of harm from current levels of workplace exposure to PTS, that the specific proposed regulatory requirements would substantially reduce the significant risk, but that such measures would not regulate

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nonsignificant risks. IUD v. API, 448 U.S. 607, ____ (1980). OSHA would be unable to make any of these showings. First, assuming OSHA were to proceed with a generic indoor air quality standard, any assessment of the need for special PTS provisions would have to examine the potential risk of harm from PTS at PTS levels that would remain after the implementation of the generic standard. As the data and information submitted by RJR and others to OSHA will clearly demonstrate, the levels of PTS constituents and surrogates that exist in workplaces that implement the types of indoor air quality measures recommended above are extremely low and cannot be shown to pose a significant risk.

Second, given the extremely low levels of potential exposure that would exist under a generic indoor air standard, the imposition of additional special controls for PTS, such as mandated smoking lounges with separate exhaust or complete smoking bans, which would effectively eliminate all or virtually all exposure, will not result in the magnitude of reduction in exposures that OSHA has universally sought in justifying control of specific toxic substance such as asbestos, ethylene oxide, benzene and formaldehyde. In other words, the incremental risk reduction would not be considered substantial under criteria traditionally applied by OSHA.

Most fundamentally, however, the imposition of such measures as mandated smoking lounges or smoking bans, which

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seek the virtual elimination of all risk would be plainly impermissible under the Supreme Court's direction that OSHA is authorized only to eliminate "significant risks" and may not seek to create a "risk-free workplace." IUD, id. at 647-650.

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DRAFT #1

DRAFT 1

COMMENTS OF

ON OSHA'S RFI ON INDOOR AIR POLLUTION,
DOCKET NO. H-122, 56 FEDERAL REGISTER 47892,
SEPTEMBER 20, 1991

I. Introduction

submits these comments in response to OSHA's Request for Information on Indoor Air Pollution, Docket No. H-122, 56 Federal Register 47892, September 20, 1991. The comment discusses the health effects caused by indoor air pollutants and strategies for reducing worker exposure to such pollutants and analyzes the legal requirements OSHA must consider in deciding whether to issue a standard.

It is our position that the health effects caused by indoor air pollution are serious and well documented; that strategies for reducing the known risks are readily available and can be feasibly implemented; that the risk to workers of serious health effects is material and significant; and that accordingly, OSHA is required to proceed with the issuance of a standard regulating indoor air pollution.

Indoor air pollution affects many of the nearly 15 million workers represented by the Indeed, respected professionals have called indoor air pollution in the non-industrial workplace an occupational health problem of epidemic proportions. Dr. J. Donald Millar, Director of NIOSH,

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testified before Congress on November 21, 1991 that indoor air pollution is one of the three epidemics facing occupational health agencies in the 1990's. Since 1978, NIOSH has seen requests for health hazard evaluations in office, educational, and health care buildings rise from 1/2 of 1% to 20% of all requests (1). Brooks et al., writing in Clinical Toxicology (1991), observe that "[a]n interesting fusion of historical and current events has led to the emergence of an epidemic of indoor air pollution and its related human health effects" (2). In 1987, the Environmental Protection Agency (EPA) ranked indoor air pollution fourth among 31 environmental problems that pose a risk to human health and the environment (3).

Indoor air pollution can have life-threatening consequences, such as Legionnaire's Disease and cancer, and even its less virulent effects cause material illnesses and disabilities. Cancer risks for reported indoor air concentrations of at least nine (9) chemicals (seven volatile organic compounds and two pesticides) are "significant" by OSHA's own criteria (4). The U.S. Centers for Disease Control estimates that 10,000 to 50,000 cases of Legionnaire's Disease occur annually in the U.S. with a mortality rate of approximately 20% (5).

An extraordinarily large number of workers are affected by indoor air pollution -- far larger than the populations normally covered by OSHA standards. The World Health

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Organization (WHO) estimated that 30% of new and renovated buildings worldwide generated excessive health complaints (6). One study of U.S. buildings suggests that 24% of office workers had building-related health complaints and 20% suffered impaired performance (7). It estimated that between 800,000 to 1,200,000 commercial buildings subject 30 to 70 million people (20-30% of building occupants) to risks of material building-related health effects.

Considerable research has been done on the subject over the past ten years. In addition to a number of academic researchers and professional associations, WHO, the National Academy of Sciences, NIOSH and EPA have recognized the scope of the problem and have offered a variety of solutions. The joint EPA-NIOSH "Building Air Quality" guide, released in December, 1991 (8), offers sound and specific guidance for assessing and controlling indoor air pollution risks.

Although indoor air pollution has been a recognized problem for many years, voluntary action by management appears to have had little effect (1), and building codes have not been modified to provide protection.

Regulating indoor air pollution not only makes good public health sense, it makes good economic sense. More than 500 NIOSH investigations revealed symptoms "severe enough to result in missed work, reassignments and even termination" (1). Because of the large numbers of workers affected by indoor air

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pollution, eliminating the costs to American businesses from absenteeism, lost productivity, and medical expenses far outweighs the costs of fundamental, common sense building-related controls necessary to mitigate the problem (7). One estimate places the cost of lost productivity alone due to indoor air pollution at $10 billion annually (7) and another due to Sick Building Syndrome at $3 billion annually (9). Preventing disease from indoor air pollution will also avoid much of the litigation and insurance claim activity that has recently begun to emerge (2, 7).

has a working group of fifteen national unions that have a particular interest in this problem, including unions that represent teachers, public employees, communications workers, and office, newspaper and health care workers. The Sheet Metal Workers' International Association has particular knowledge and expertise on properly designed ventilation systems, the key to solving the problem. Our comments combine the working group's direct experience with what we believe to be the scientific and technical consensus of the nature of the problem, its causes and solutions. Scientific reports and studies document our conclusions and are included with this submission. Taken together, this evidence establishes a compelling case that OSHA should immediately issue a notice of proposed rulemaking based on our recommended standard and proceed to issue a final rule at the earliest practical date thereafter.

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VII. Recommended Standard

1. Scope and Application

The standard should cover all employers who own, operate, manage or otherwise control buildings regulated by the standard, whether or not their own employees are occupants of the building. OSHA's own view on its authority to regulate these employers is discussed in the preamble to OSHA's proposed rule to amend the asbestos standard, 55 Fed. Reg. 29729/2, July 20, 1990.

The standard should cover all buildings used as a place of employment for offices, commercial activities, health care, and public functions, or any combination of these. Buildings used exclusively for industrial purposes should be excluded.

2. Written Program

Each building covered by the standard should have a written program for maintaining healthful indoor air quality. The program should require meaningful participation of workers. It should provide for (1) a comprehensive evaluation, initially and annually thereafter, of all factors that affect indoor air quality; (2) a plan for mitigating indoor air pollution when detected in the building, and (3) an ongoing program of monitoring, HVAC maintenance, recordkeeping, and employee

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information and training. The EPA/NIOSH Guide for Building Owners and Facility Managers, December 1991 (8) should be followed by OSHA as guidance for specific requirements for each of these provisions.

a. Evaluation. Should include monitoring of the HVAC system, including CO_2 concentrations, to detect ventilation effectiveness; an evaluation of specific, likely sources of air contaminants, an assessment of employee complaints, illnesses and absenteeism; and microenvironmental factors.

b. Mitigation Plan. Should be required when established standards for radon, asbestos and other toxic chemicals are exceeded or when the number of health complaints or illness exceeds a certain percentage of building occupants within a given time period or when HVAC system criteria are not met. Should contain requirements for proper design, operation and maintenance of the building's HVAC system as a primary control strategy. ASHRAE guidelines should be used as guidance for development of objective criteria. The plan should specify source controls and work practices where appropriate.

c. On-Going Program. Air quality must be regularly monitored and the results recorded. Regular HVAC maintenance and employee complaint logs should also be kept. Employees should be trained to recognize the causes and health effects of

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indoor air pollution and be given access to all information concerning air contaminants in the building and the HVAC system's design and operation specifications.

VIII. Conclusion

Health effects caused indoor air pollutants are serious and well documented and the number of American workers exposed are very large. Strategies for reducing exposure are readily available, cost effective and would not be burdensome to employers. The risk to workers of serious health effects from current exposure to indoor air pollutants constitute a significant risk of material impairment to health and thus require OSHA to proceed with the issuance of a standard.

Finally, the recommended standard proposes feasible cost effective control measures that will enable OSHA to provide greater protection to American workers and thus meet its statutory duty to "assure safe and healthful working conditions for working men and women."

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DRAFT #2

SUMMARY OF RECOMMENDATIONS

The following is a summary of our recommendations based on our experience in the 26 case studies cited and numerous other IAQ investigation in which has been involved. Further detail is provided in the response to Question 92.

1. Most IAQ problems are a result of improper or ineffective ventilation. The Occupational Health Administration should issue a standard to provide uniform requirements. It should focus on effective design, operation and maintenance of building HVAC systems.

2. The OSHA standard should provide a multi-level approach including:
   - Ventilation and operating standards;
   - Information dissemination;
   - Training programs for employers and operators;
   - Reporting requirements;
   - Complaint procedures and administrative guidelines and
   - Problem investigation protocol and procedures.

3. The OSHA standard should be separate and distinct from industrial programs in view of the different types of problems and differing technology and nature of response. Non-industrial indoor air quality problems are of an entirely different nature from industrial or service industry occupational exposures where a small number of easily identifiable contaminants at relatively high levels of concentration are of concern. Additionally, non-industrial IAQ problems most commonly result from a number of dispersed sources of materials, which are inadequately handled or are exacerbated by the HVAC system.

4. While comfort and satisfaction with environmental conditions certainly do affect worker job satisfaction and productivity, it is not appropriate for OSHA to "regulate comfort." In view of the lack of any standard for the large numbers and low levels of pollutants in the workplace, a program which focuses on proper design and effective operation and maintenance of a building ventilation systems is recommended.

5. OSHA standards should focus on prevention. Policies and criteria for OSHA intervention in problem situations should be clearly established. IAQ "problem" situations in the non-industrial workplace tend to be difficult to define. Programs of training, prevention and pro-active maintenance are recommended rather than intensive inspection and enforcement.

6. Compliance and enforcement should focus on documentation of correct operation and maintenance of HVAC systems to accommodate individual workplace needs. An enforcement program which features random spot checks of pollutant concentration would be ineffective due to the sophisticated

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and expensive testing and lack of any standards that define a hazardous situation. A system which develops procedures and requires a response to complaints as quickly as possible after they are reported is important and should be required. IAQ problems generally tend to have lower level effects and are temporary in nature. Immediate response and follow-up procedures are required to assure that hazardous situations are investigated when they occur or as soon as possible thereafter.

7. Preventive guidelines and procedures should focus on adequacy of design, operation and maintenance of air supply, exhaust and treatment systems. Programs should include information and training for workplace operators, supervisors, owners and maintenance staff.

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suspects that certain workplaces are included and others are excluded for any number of personal and political reasons. As an example, many ordinances specifically cover public places where occupancy is transient, such as restaurants, waiting rooms, lobbies, banks, etc. In these cases, the ordinances are apparently set to protect the visiting public, not the employee. To our knowledge there is no data that relates casual exposure from transient or even long term exposure to PTS to adverse health effects. In our opinion, most of these ordinances have resulted from pressure by groups opposed to smoking because it offends their aesthetic values, not because of adverse health effects.

Question 88(b): Please identify sections of this rule, regulation, or guideline that are different for certain types of employers of or conditions of employment (e.g., restaurants, private offices, and factories) as compared to others (e.g., general office space and public space).

See Appendix IV

Question 88(c): Are structural changes in the ventilation system of the building or barriers between smoking and non-smoking sections ever a specified option for employers in attempting to comply with the rule, regulation, or guideline?

In experience, many local and city ordinances include a provision that permits smoking in areas which are physically separated from non-smoking areas (i.e., with a partition). Some ordinances require a "separate HVAC system," while others do not.

As stated previously, we believe that adequate, properly designed ventilation will decrease complaints and reduce pollution. However, if a facility opts for segregation, we believe there is no need to require physical separation or separate ventilation if a workplace chooses to implement a policy that separates areas in which smoking is permitted from areas in which smoking is not permitted. In many cases, it is impossible to set up directional air flow patterns, which effectively isolate the smoking area due to of its "downstream" location. It is also possible, usually at minimal expense, to exhaust a significant proportion of the air from the smoking permitted area <u>or</u> to treat the return air via physical and chemical filters so that odor-causing VOCs and particulates are removed.

Question 92: If OSHA determines, on the basis of adequate evidence, that regulatory action is needed to protect employees from adverse health effects related to indoor air quality, what elements do you believe such regulation should include? Please provide a basis for your suggested element(s).

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1. In view of the time and expense of research required to develop a program based on exposure limits (similar to the existing industrial program), we recommend that a program based on standards for the design, operation and maintenance of ventilation systems be developed and promulgated for enforcement. Such a program should be rigorously enforced.

   Our case studies, including a wide body of technical literature as well as the recent EPA/NIOSH documents cited elsewhere, confirm that inadequate design, maintenance or operation of buildings' ventilation systems are the primary cause of IAQ problems. Additionally, our case studies show that inadequate ventilation system operation or maintenance was a contributing factor in more than 90% of the cases. A regulatory program (for the present, until standards are set) should involve guidelines for the design operation and maintenance of HVAC systems. Obviously, even after IAQ standards and pollutant levels are set (<u>if</u> ever), ventilation guidelines will always play a major role in a prevention program.

2. Training
   OSHA should develop formal training programs which include at least the following:

   a) A program intended for building owners and managers advising them of their responsibility to provide acceptable IAQ and informing them of required procedures, standards, etc.

   b) A program for building operative staff which includes technical information as well as procedural/administrative information, including written documentation of IAQ complaints and HVAC system operation.

   c) A program which <u>certifies</u> curriculum and qualifications for IAQ inspection specialists who can certify a facility's IAQ program as meeting minimum standards and to conduct IAQ investigations in problem buildings.

3. OSHA/NIOSH should develop additional printed and other media materials currently available to inform and advise employers and employees of the approach.

   These materials should be compiled into a more formal set of procedures or protocols which could, (at some future time) be adopted as standard protocol or "required approach".

4. Proposed Program Elements

An OSHA standard should require each employer or building owner/operator to develop and implement an IAQ plan for each building in which employees work. The plan should be developed in conjunction with building management and employee representatives and should take into account the type and design of the HVAC system

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in the building, the particular indoor and outdoor pollution sources, the size and nature of the workforce and other factors unique to the building. Each plan should incorporate the following requirements:

1. Appointment of a building IAQ coordinator and a joint labor-management committee to develop and implement the IAQ plan;

2. An initial building survey/inspection, which should include:

(a) a visual inspection;
(b) measurement of basic IAQ parameters to assure proper operation and maintenance of the HVAC system and
(c) an employee questionnaire to cover complaints and ascertain potential contamination sources;

3. Periodic monitoring/inspections, including basic IAQ parameters (air changes, flow rates, static pressure, CO_2, humidity, temperature);

4. Periodic maintenance of HVAC system;

5. A reporting and record-keeping system to log worker complaints about building discomfort, medical symptoms, and medical treatment that could be related to indoor air pollution;

6. An employee training and information program that enables employees to recognize indoor air problems and provides regular information to employees on management efforts to respond to complaints, evaluate air quality and mitigate problems and

7. Operation of the existing HVAC system to its maximum design potential, including the utilization of interior spaces consistent with the design with the design;

8. A written procedure for responding to IAQ complaints and any mitigation actions arising out of health complaints or indadequacies in the HVAC system. Mitigation actions should include the following principles:

a. Applying local exhaust ventilation and/or air cleaning on specific sources only after general dilution ventilation methods are ineffective;

b. Using engineering controls on specific sources of contamination that are not amenable to HVAC soltuions;

c. Avoiding methods of reducing exposure that involve restrictions on employee behavior, redesigning jobs or work schedules or other practices that involve labor-management relations.

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The standard should also include a requirement that all new and renovated buildings comply with ASHRAE 62-1989, and, for operating existing systems, should include performance criteria for HVAC systems which are based on the ASHRAE 62-1089 standard.

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DRAFT #3

DRAFT #3

COMMENTS ON

REQUEST FOR INFORMATION REGARDING

OCCUPATIONAL EXPOSURE TO INDOOR AIR POLLUTANTS

I. INTRODUCTION

appreciates the opportunity to provide information on occupational exposure to indoor air pollutants, and commends the Agency on its decision to investigate the many complex issues relating to indoor air quality (IAQ). is an association of companies with strong, but varied, interest in the indoor air issue. Among its members includes architects, building engineering firms, clean room specialists, IAQ monitoring and mitigation firms, and manufacturers of building products, consumer products, chemicals and raw materials, and office products.

Since its inception in 1988, has advocated the implementation of a building-systems approach as the most cost-effective method for ensuring adequate IAQ. This approach

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encompasses the proper design, operation, and maintenance of heating, ventilation, and air conditioning (HVAC) systems and is described in greater detail below and in Attachment 1.

To aid in its review, comment is divided into four sections. Section II addresses the final question in the Request for Information regarding the potential content of an OSHA indoor air regulation. Section III of the comment provides the legal framework for promulgation of an OSHA indoor air standard. Section IV summarizes some of the evidentiary support that exists for implementation of such a standard.

Finally, Section V includes responses to many of the other questions raised in the Request for Information. For those questions addressing a company's individual policies, practices, and experiences, has summarized the experiences of its members engaged in IAQ investigation activities. Since concentrates on general, rather than specific, IAQ issues, we have not provided answers to those questions concerning specific pollutants.

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II. POTENTIAL CONTENT OF REGULATION

considers the building-systems approach to be an important management tool that should be applied to both existing and planned buildings. recommends that future approaches to indoor air include provisions for optimal air exchange and filtration and proper management of building systems. Specifically, recommends that a technology-based approach to addressing indoor air quality in commercial buildings include the following items:

- minimum ventilation rates or other means of achieving acceptable indoor air quality as defined in ASHRAE Standard 62-1989,

- annual inspections of the air handling equipment to confirm correct operating procedures and to ensure adequate standards of cleanliness,

- use and maintenance of filters and other air cleaning devices that meet applicable ASHRAE guidelines,

- a comprehensive statement of the ultimate heating, ventilation and air conditioning (HVAC) system

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performance criteria, and

- o commissioning of buildings, consistent with ASHRAE Guideline 1-1989, to ensure performance to specifications.

To date, the most frequently proposed regulatory approach to improving indoor air quality through ventilation and building-systems management has been the adoption of federal performance standards. In our view, a comprehensive building-systems approach should certainly include, but not be limited to, specific performance guidelines for ventilation. As is often the case, however, the development of general, average guidelines or specifications may not adequately address the complexities and variations in commercial building environments. The results of a study conducted by a member suggest the potential for wide variations in ventilation rate between summer and winter and between the zones of the building. These data demonstrate the complexities associated with providing adequate ventilation, even in a well-designed building, and the limitations of using average values.

There is much more to the building-systems approach, however, than ventilation rates. Proper maintenance of these systems is crucial to ensuring good indoor air. Adequate

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training also is an integral part of proper building-systems maintenance. We suspect that indoor air quality is not currently a major part of the various curricula offered for stationary (i.e., building) engineers. A certification program for these engineers might be one method for augmenting their training and awareness in this area. We also believe that indoor air quality should play a stronger role in the design of new and remodeled buildings. One way this can be accomplished is through modification of building codes.

Taken in its entirety, the building-systems approach is far superior in terms of cost-effectiveness to alternative approaches for several reasons.

First, the building-systems approach remedies a broad array of indoor air quality problems by increasing outdoor air supply, improving its distribution within the building, and decreasing exposure to biological and chemical contaminants. Moreover, this approach provides a practical solution for indoor air quality problems without the need for identification and control of myriad individual pollutants. Because such a large number of pollutants may be present in indoor air, the most effective strategy is one that directs resources toward controlling the broadest array of indoor pollutants.

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Second, the benefits provided by the building-systems approach remain intact as the mix of pollutants changes over time. Thus, if building use or interior furnishings change (thereby changing the degree and nature of the potential indoor air quality problem), the approach remains effective. Source controls designed to protect against exposure to a particular pollutant may be rendered obsolete when the pollutant mix changes.

Finally, the building-systems approach can be implemented without a detailed understanding of the potential interactions of a wide variety of pollutants at low levels. A system for evaluating such interactions likely will not be available for many years.

A large body of experience from public and private organizations supports the building-systems approach. Extensive field experience in recent years has shown a very high level of success when applying these principles. Application of this approach has already proven itself to be the most economical and effective means of immediately making indoor environments more pleasant places to work.

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supports the development of uniform criteria relating to ventilation and other building systems that addresses certain compliance limitations of older buildings. While an increasing number of states are adopting technology guidelines such as the ASHRAE standard, these guidelines generally do not encompass the operation and maintenance of building systems. Further efforts to encourage a uniform approach to this issue are necessary.

Such an indoor air standard would be generally applicable to all employers, including many small businesses in older buildings who may argue that compliance would put them out of business. OSHA could address this concern by exempting some class or classes of employers on feasibility grounds. Alternatively, OSHA could consider a "grandfather" provision in the standard which would make the standard applicable only to new or remodeled buildings. OSHA has used grandfather clauses in the past to exempt employers from certain provision of a standard, such as OSHA's electrical standards[1] and OSHA standards governing marine terminals.[2]

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1 29 C.F.R. Section 1910.302(b).

2 29 C.F.R. Part 1917; 48 Federal Register 30885, 30887, (July 5, 1983).

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PHILIP MORRIS MANAGEMENT CORP. INTER-OFFICE CORRESPONDENCE

120 PARK AVENUE, NEW YORK, N.Y. 10017-5592

TO: Steven C. Parrish

DATE: March 28, 1992

FROM: Denise F. Keane

SUBJECT: OSHA/RFI

As per your request, attached you will find a rough draft on the OSHA/RFI process. Please identify whatever changes you would like me to make. They can either be faxed to me in Miami, or I will get to them when I return to the office on Monday, April 6th.

Give Sandra a call if you want copies of any documents not provided.

DFK:sl
Attachment

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OSHA - RFI

The Occupational Safety and Health Administration (OSHA), which is part of the Department of Labor, published a Request for Information (RFI) on September 20, 1991. The comment period closed March 20, 1992.

OSHA, with certain exceptions, has regulatory jurisdiction over the workplace, and the RFI is the first step in possible regulatory rulemaking relating to indoor air. The RFI process does not require OSHA, however, to take any specific future action. (NOTE: This is in contrast to an Advanced Notice of Proposed Rulemaking or a Notice of Proposed Rulemaking which are more advanced stages in the OSHA process.)

We believe that a balanced regulatory structure is possible if OSHA pursues rulemaking based on an objective review of the science. We believe that a crucial element of our strategy in accomplishing this objective is to encourage OSHA (1) to assert jurisdiction and (2) to proceed quickly with a comprehensive regulation on indoor air.

Reasons for this strategy include the following:

OSHA to Assert Jurisdiction

- We believe that there will be a regulation(s) on indoor air. OSHA is preferable to EPA, where we know where we stand and which traditionally follows a substance by substance approach or source control strategy.

- We are hopeful that we will receive far less bias consideration at OSHA as we are confident that we will be more successful at building coalitions with other companies, legislators, administrators, etc., as part of the OSHA process. NOTE: This is assuming that OSHA continues to focus on the overall issue of IAQ as opposed to ETS specifically.

OSHA to Act Quickly

- OSHA, which has a reputation for acting slowing, is getting pressure from groups such as ASH and others in Congress to act quickly. Also, Congress is considering IAQ legislation, which depending on its version, could give greater regulatory authority to EPA.

- ETS could be put on a separate fast track if OSHA delays.

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TIMING

The OSHA process could take at least 2-5 years, including appeals. A very optimistic schedule might look as follows:

March '92 - comments received
Fall'92/Spring '93 - proposed rule or standard
Summer '93 - hearings
Winter '94 - final standard

RFI QUESTIONS

There were 92 questions posed by OSHA on the RFI covering a wide range of issues on IAQ including: ventilation system performance; methods for assessing and monitoring IAQ; building maintenance programs; discussion of health effects attributable to poor IAQ; discussion of ETS health effects, smoker separations and smoking policies; potential contents of a regulation.

OSHA DOCKET

To date, over 1,100 submissions have been received on the docket, which, in terms of numbers, is a staggering response to a RFI by OSHA standards. There are four groups within OSHA that will be reviewing the submissions. Responses fall into three categories: general comments on the IAQ issue, pro-smoking comments and anti-smoking comments.

The docket is important to us as well because part of the official OSHA "record" which may be used and relied upon by OSHA in any rulemaking on indoor air. The comments may also comprise part of the record for any court review of OSHA action. With this in mind, we have tried to be complete in compiling an exhaustive record on the science, and a detailed record on the total IAQ issues, in the belief that this will make it more likely that the OSHA focus will be on the total IAQ issue and not one source such as ETS.

APPROACH

We have attempted to take what might be described as a forthright position with OSHA. We describe ourselves as the employer of 166,000 workers, as a building owner/manager and as a major manufacturer both in the United States and internationally. As we have endeavored to answer most of the 92 questions posed and to identify, and in many cases, provide copies of relevant and

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supporting studies/reports/articles, etc., our response is probably over 1,000 pages in length. In addition to individual question summaries to all questions answered, however, we have prepared an Executive Summary and a refutation of the Surgeon General's comments on ETS, the NIOSH CIB and the EPA draft risk assessment. (Copies of the Executive Summary and our Refutation on the Science have been attached.)

Despite our interest in having OSHA assert jurisdiction and act quickly, we do not urge regulation. On the contrary, the crux of our position is to argue that ETS plays a minor role in sick building syndrome and that typical exposures to ETS in the workplace are minimal. We urge that no regulation on ETS is necessary. We refer to NIOSH and other data bases that find ventilation responsible for over 50% of investigated IAQ complaints--compared to the 2-5% of investigated complaints that have been attributed to ETS.

We do go on to provide information on IAQ problems and provided studies/reports on IAQ--particularly highlighting the building systems approach. (NOTE: A building systems approach means a focus on design, construction, operation and maintenance of buildings to provide good IAQ.) We also identify F.A.C.T., or filtered air control technology, which is a state of the air ventilation system developed by R&D and PM Engineers in Richmond. F.A.C.T. plays the dual role of being illustrative of PM's interest in the IAQ issue, and its interest in providing solutions.

Another aspect of our approach has been to remind OSHA that to the extent that it concludes that regulation is required--that it follow the OMB policy circular that urges government to adopt private industry standards where feasible. We go on to help identify industry standards. The American Society of Heating Refrigeration and Air-Conditioning Engineers (ASHRAE), arguably the most important organization which promulgates standards in this area, has a standard on ventilation which we have highlighted. Significantly, this standard (as opposed to its predecessor which had a dual standard for smoking and non-smoking rooms) is premised on smoking by 30% of room occupants.

We believe that the success of PM's accommodation policy will in part be determined by how the IAQ issue is resolved. We are hopeful that as part of the RFI process, OSHA will better appreciate the complexity of the IAQ issue and put ETS in its proper perspective--as a visible indicator of poor indoor air--but as a very minor contribution to the IAQ problem.

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Smoking policy question

DEPARTMENT OF LABOR

Occupational Safety and Health Administration

29 CFR Part 1910

[Docket No. H-122]

RIN 1218-AB37

Occupational Exposure to Indoor Air Pollutants; Request for Information

AGENCY: Occupational Safety and Health Administration (OSHA), Labor.

ACTION: Request for information.

SUMMARY: By this notice, OSHA requests comments and information on issues pertinent to indoor air quality (IAQ) in occupational environments. This notice raises major issues which the Agency needs to consider in determining whether regulatory action is appropriate and feasible to control health problems related to poor indoor air quality. The issues on which comment is requested are organized into five broad categories: (1) Definition of and Health Effects Pertaining to Indoor Air Quality; (2) Monitoring and Exposure Assessment; (3) Controls; (4) Local Policies and Practices; and (5) Potential Content of Regulation.

Specifically, information is requested on the definition of and the health effects attributable to poor indoor air quality; ventilation systems performance; protocols for assessing indoor air quality; mitigation methods; building maintenance programs; and the potential contents of a regulation should the Agency determine that such action is appropriate. In addition to seeking information regarding IAQ concerns in general, issues addressed in this notice also focus on specific indoor air contaminants such as passive tobacco smoke (PTS), radon and bioaerosols. With respect to these particular contaminants, information is requested on their relative contribution to the overall degradation of indoor air quality as well as associated health effects and methods of exposure assessment and mitigation.

This Notice invites interested parties to submit comments, recommendations, data and information on the issues detailed in this document as well as other pertinent issues. The information received in response to this Notice will be carefully reviewed and will assist OSHA to determine whether it is necessary and appropriate to pursue regulatory action concerning occupational exposures to indoor air contaminants.

DATES: Comments should be postmarked on or before January 21, 1992.

ADDRESSES: Comments should be submitted in quadruplicate to the Docket Officer, Docket No. H-122, room N-2625, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210. Telephone: (202) 523-7894.

FOR FURTHER INFORMATION CONTACT: Mr. James F. Foster, Occupational Safety and Health Administration, Office of Public Affairs, Room N-3649, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210. Telephone: (202) 523-8151.

SUPPLEMENTARY INFORMATION:

I. Background

Health complaints related to indoor air quality (IAQ) increased significantly following energy conservation measures instituted in the early seventies. Such measures have generally reduced the infiltration of outside air, allowing the build-up of indoor air contaminants.

Adverse health effects which may be associated with indoor air contaminants are classified as: (1) Sick building syndrome (sometimes called tight building syndrome), and (2) building-related illness.

Sick building syndrome is characterized by general complaints which may include headaches, fatigue, nausea, mucous membrane (eye, nose, and throat) irritation, coughs and muscle pain. These conditions generally are not traceable to a specific substance, but are sometimes attributable to exposure to a combination of substances or to individual susceptibility to lower concentrations of contaminants. Typically, the symptoms are reversible, disappearing or dissipating when the affected individuals leave the building.

The term "building-related illness" describes those specific medical conditions of known etiology which can often be documented by physical signs and laboratory findings. Such illnesses include respiratory allergies and Legionnaires' disease. Building-related illnesses are potentially severe and, in contrast to sick building syndrome complaints, are often traceable to a specific contaminant source such as mold infestation and microbial growth in cooling towers, air handling systems and water-damaged furnishings.

OSHA believes that the major sources of indoor air pollutants include the following:

(1) Sources outside the building, e.g., contaminated ambient air and radon.

(2) Emissions from nearby sources, e.g., vehicular emissions from garages, loading platforms and nearby roads.

(3) Equipment, e.g., contaminated HVAC systems and emissions from office equipment.

(4) Human activities, e.g., smoking, housekeeping activities, maintenance activities, and pest control.

(5) Building components and furnishings, e.g., emissions from new furnishings and carpets.

Analyses of specific pollutants in indoor workplaces have identified several hundred volatile organic chemicals (VOCs) as well as other compounds. Several chemicals have been identified for which OSHA has established permissible exposure limits (e.g., formaldehyde, acetic acid). However, investigations of employee complaints regarding indoor air quality have generally shown levels well below permissible exposure limits for OSHA-regulated substances.

Over the past decade, the National Institute for Occupational Safety and Health (NIOSH) has conducted approximately 500 Health Hazard Evaluations for indoor air quality. (Health Hazard Evaluations are workplace investigations conducted at the invitation of the employer to determine the presence of health hazards and to recommend measures to remove them.) The primary types of problems encountered in these investigations were categorized as: inadequate ventilation (52%); contamination from inside the building (17%); contamination from outside the building (11%); microbiological contamination (5%); contamination from building materials and furnishings (3%); and unknown sources (12%).

A particular concern in matters dealing with indoor air quality is exposure to passive tobacco smoke (PTS). A wide range of health effects caused by passive exposure to tobacco smoke has been reported by the Surgeon General, the National Research Council, the Environmental Protection Agency (EPA), and private researchers, as well as by persons reporting health effects due to exposure to passive smoke while at work. These effects range from acute annoyance and eye and respiratory tract irritation to the development of chronic pulmonary disease, cardiovascular disease, and lung cancer.

Tobacco smoke has been classified as a human carcinogen by the International Agency for Research on Cancer (IARC), the Surgeon General, and the EPA. Nonsmokers make up a majority of workers in the workforce (e.g., in 1985 only 33% of men and 28% of women smoked (Tager 1989)). OSHA has estimated, using experimental exposure data published by Cummings et al.

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(1990), that up to 77% of the nonsmoking workforce, approximately 75 million men and women, is exposed to PTS while at work.

It has been established in many reports that tobacco smoking is one of the major factors causing poor indoor air quality and that nonsmoker exposure to PTS while at work can be significant. It has also been established that of the more than 3,800 compounds in PTS, 60 are known or suspect carcinogens (Repace and Lowrey 1985). Other PTS constituents are recognized as human teratogens and acute respiratory irritants (Tager 1990).

Public concern over exposure of nonsmokers to PTS while at work and the potential life-threatening health effects resulting from that exposure prompted two public interest groups to petition OSHA for an Emergency Temporary Standard (ETS) in May 1987 to prohibit smoking in all indoor workplaces except for certain specified areas. OSHA determined that available data did not demonstrate that a "grave danger" as defined in section 6(c) of the OSH Act existed due to workplace exposure to PTS. Since the available evidence would not support a "grave danger" finding, OSHA denied the petitions in September 1990.

In response to the OSHA denial, Action on Smoking and Health (ASH), one of the petitioners, filed a petition for review in the United States Court of Appeals for the District of Columbia Circuit in October 1989, seeking to compel the issuance of an ETS. The court upheld OSHA's decision not to issue an ETS in an unpublished decision issued May 10, 1991.

As part of this document asking questions about all major indoor air contaminants, the Agency is also requesting information on occupational exposure to radon. These questions refer not only to the documented health effects attributable to ionizing radiation given off by radon daughters, but also assessment strategies for evaluating ambient levels and mitigation methods for its abatement.

II. Key Issues on which Comment Is Requested

Definition of and Health Effects Pertaining to Indoor Air Quality

(1) How would you define poor indoor air quality?

(2) OSHA solicits the following information with respect to adverse health effects associated with poor indoor air quality:

(a) What data are available that associate adverse health effects with exposure to the following types of indoor air contaminants?

(i) Chemical agents.

(ii) Bioaerosols.

(iii) Passive tobacco smoke.

(iv) Radon.

(b) Based on observations in your workplace or your knowledge of research results, describe the adverse effects that you believe may be attributable to the quality of indoor air.

(c) What percent of the workforce suffers adverse health effects due to poor indoor air quality in their workplace? What is the basis for your estimates?

(d) Based on observations in your workplace or your knowledge from other sources, how much lost work time and decreased productivity may be traceable to illnesses related to poor indoor air quality? What is the basis for your estimate?

(e) Are there any other indicators of workers' illness related to poor indoor air quality?

(3)(a) What correlation, if any, can be made between symptoms presented in IAQ complaints and type of causative agent? For example, are certain symptoms more indicative of exposure to chemical contaminants as opposed to biological contaminants? Please give examples.

(b) If such a correlation has been made, how effective is this information in identifying sources of contaminants?

(4) At least one report (Woods 1989) estimates that between 800,000 and 1,200,000 commercial buildings in the United States have problems that may be classified as Sick Building Syndrome, potentially affecting some 30 to 70 million occupants. The Agency solicits additional data relevant to the development of more precise estimates of the number of workplaces with indoor air quality problems and the number of employees adversely affected.

The following questions are designed to solicit information regarding bioaerosols as a specific source of indoor air contamination:

(5) In cases where IAQ investigations have identified a bioaerosol as the etiologic cause of a building-related illness:

(a) Did complaints occur within a specific length of time?

(b) Were there similarities in symptoms among affected individuals which suggested exposure to a specific agent, e.g., *Legionella pneumophila*? Was the etiological agent identified?

(c) What laboratory tests were performed to confirm that a specific bioaerosol was responsible for health complaints?

(d) How was the problem resolved?

(6) IAQ investigations conducted by NIOSH indicate that some type of biological contaminant was involved in five percent of the cases.

(a) Are there other data available which indicate the prevalence of biological contaminants as the cause of adverse health effects? If so, please indicate the source of such data.

(b) Are data available which indicate the likelihood that health complaints are related to a specific bioaerosol contaminant? If so, please indicate the source of such data.

A wide spectrum of health effects, including headaches, upper respiratory tract irritation, low birthweight, cardiovascular disease, and lung cancer has been associated with nonsmoker exposure to passive tobacco smoke (PTS). Response to the following questions is requested to enable OSHA to identify specific worker populations that may be sensitive to passive tobacco smoke exposure in the workplace.

(7) Persons with underlying health problems or chemical sensitivities often cannot work in industries where physical strength and endurance or exposure to chemicals occur in the normal job experience.

(a) Is there evidence to suggest that these persons are more susceptible to developing health effects due to short-term exposure to PTS, such as eye and respiratory tract irritation?

(b) Is there evidence to suggest that these persons are more susceptible to developing health effects due to long-term exposure to PTS, such as cardiovascular disease and lung cancer?

(8) Some people may develop an increased sensitivity to chemical pollutants, such as found in PTS, during pregnancy or treatment with certain medications (Calabrese 1978). What additional studies pertain to this sensitivity?

(9) OSHA requests data on the annual incidence rate of chronic obstructive lung disease, asthma, and allergies in the general population. If available, these data will assist the Agency in estimating accurate risk numbers.

(10) OSHA requests the latest, most accurate data on smoking behavior in the working population, with as much detail as possible with respect to age group, sex, race, and occupation.

(11) To your knowledge, have PTS exposures been associated with specific adverse health endpoints in humans?

(12) To your knowledge, have PTS exposures been associated with specific adverse health endpoints in experimental animals?

With respect to IAQ problems, certain reports indicate that multiple factors

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may influence health complaints. Such factors may include psychosocial considerations, physical stressors such as temperature, lighting and noise and ergonomics.

(13)(a) Have these factors been considered in instances where IAQ investigations have failed to identify a specific contaminant source?

(b) If yes, was remedial action taken to improve these conditions? Please explain what that action was.

(c) Did health complaints decline?

Monitoring and Exposure Assessment

(14) If your company keeps records of employee IAQ complaints, can you summarize your experience, emphasizing your efforts to localize the problem, identify the contaminants, determine the adverse health effects, and action taken?

(15) Considering the wide variation in individual responses to chemical or biological exposures and other factors related to indoor air quality, what events should trigger an IAQ investigation?

(16) What physical evidence which might trigger an IAQ investigation (such as stagnant water, mold, broken fans, dirty vents, barriers to good air mixing, new carpeting/insulation) have been identified by you or your employees?

(17) Dust mite infestations in indoor environments are implicated as a cause of allergic reactions and exacerbation of asthma. Recognized as a significant problem in residences, such infestations may be associated with similar complaints in occupational settings.

(a) Has your workplace ever monitored for dust mites?

(b) If yes, why was the monitoring conducted?

(c) Did the results of the monitoring indicate a dust mite infestation?

(d) What methods were used to determine the presence of dust mites?

(18) Colony forming units (cfu) are the usual units used to express measurements of bioaerosols. What correlation, if any, can be made between the number of cfu per cubic meter of air and the potential to cause adverse health effects in susceptible individuals exposed to such contaminants?

(19) What data, if any, are available that suggest that the effects of bioaerosols are influenced by seasonal changes?

(20) Have you made measurements of ventilation rates (in terms of air exchanges or CFM)?

(a) If so, what were the measurement results?

(b) Have you sampled for bioaerosols or other contaminants, e.g., respirable suspended particles?

(c) Was there any correlation between the ventilation measurements and sampling results?

According to the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), two fundamental procedures are used to improve indoor air quality: (1) Increase ventilation, thereby increasing fresh air introduction and

(2) Measure air contaminant levels and contain them below specified levels (ASHRAE 1988). Thus, air quantity and quality are important considerations in ensuring clean indoor air. The following questions cover ventilation systems and their relative effectiveness.

(21) Please describe the industry you are part of and the type(s) of ventilation system(s) used currently in your workplace?

(a) Natural—wind through open doors or windows

(b) General Exhaust—strategic placement of fans

(c) HVAC System—centrally controlled heating, ventilating, and air conditioning system

(22) Do you have specific data indicating that Variable Air Volume (VAV) systems are associated with more IAQ complaints than Constant Volume (CV) systems?

(23) What monitoring techniques other than ventilation rates do you use to measure indoor air quality in your workplace?

(24) Current IAQ investigations indicate that ambient levels for specific substances are typically found to be within occupational exposure limits.

(a) If your workplace has conducted air monitoring for specific substances, why was such sampling done?

(b) For what substances did you monitor?

(c) What were the concentrations for each substance?

(d) What types of instruments were used in conducting the sampling?

(e) How often did you conduct the sampling?

(25) Specifically, carbon dioxide at levels of 800 to 1,000 ppm has been a traditional indicator of poor indoor air quality due to poor air exchange.

(a) Have you conducted any carbon dioxide monitoring?

(b) If so, what concentrations were found?

(26)(a) Is there any evidence to suggest that IAQ complaints coincide with specific amounts of specific volatile organic chemicals (VOCs) in air (e.g., formaldehyde)? That is, can VOCs in mg/m^3 be used as a measure of IAQ?

(b) Are there practical sampling methods available for estimating total VOCs in air?

(27) NIOSH has developed guidelines for IAQ investigations (NIOSH 1987). If your workplace has conducted investigations:

(a) Did you try an approach different from NIOSH's in your investigation?

(b) If yes, please explain how your approach differed from the NIOSH guidelines.

(28) Did you use existing staff (e.g., a staff industrial hygienist), or external assistance (e.g., OSHA consultative services or a private consultant), in conducting the monitoring?

(29) What were the costs of the survey? Please separate them, if possible, into direct costs (such as detector tubes and labor costs), and indirect costs (such as durable item equipment and clerical support).

(30) In the laboratory evaluation of monitoring samples, did you use laboratory staff or contract with an outside analytical service?

(31) What were the laboratory costs associated with the samples?

(32) In the absence of visible indicators of potential microbial growth such as water-damaged carpeting or furnishings and accumulation of water and slime in HVAC components, what conditions would indicate the need for bioaerosol monitoring?

(33) (a) If you suspect bioaerosol contamination, what sampling techniques do you use to determine the presence or concentration of such contaminants?

(b What have been the results?

(c) Were any remedial actions necessary?

(d) If so, what actions did you take?

(e) Did you resample following the initial actions?

(f) Did it make a difference?

The following questions specifically ask for information on exposure assessment of workers exposed to PTS and on smoking policies adopted by various employers:

(34)(a) Have you conducted IAQ assessments relative to tobacco smoke contamination?

(b) If yes, for what substance(s) did you measure and what were your results?

(c) What was the cost in terms of personnel and laboratory services?

(35)(a) Is information available on the concentration of PTS components, such as nicotine and particulate matter, detected in the air of indoor workplaces?

(b) If you know of such information, please provide available references.

(36) Are data available that demonstrate specific ranges of concentrations of cotinine or other

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biomarkers in biological tissues that are associated with specific levels of exposure to nicotine in PTS?

(37)(a) What is the relationship between inhaled nicotine and cotinine levels in body fluids?

(b) How does this relationship differ for smokers versus nonsmokers?

(38) Are there identifiable biological markers for cumulative exposure which would facilitate investigation of chronic diseases associated with exposure to PTS?

(39)(a) In workplaces where a restricted smoking policy has been implemented, has monitoring and evaluation been performed to determine its effectiveness in reducing levels of PTS components?

(b) If so, what substances are monitored?

(c) How is this monitoring conducted and how frequently is the policy evaluated?

The following questions deal with radon as a ...

(40) Havi ... radon in yo ...

(41) If yo ...

(a) Why ...

(b) Who ...

(c) Wha ... level?

(d) Whe ... (basement ...

(e) Wha ... (alpha tra ... did the mon...

(f) Over what period of time did monitoring take place?

(g) How long was each monitor left in place?

from exp.

IAQ - policy

Controls

(42) Some citations in the literature state that the primary source of bacteria released into the indoor environment is the human body. Has your workplace addressed spatial considerations to prevent overcrowding, and thus reduce the person to person spread of disease? How did you do this?

(43) Do you have evidence to show that overcrowding is a source of bioaerosol formation?

(44) Do you increase ventilation flow in particularly crowded worksites or conversely reduce ventilation during non-work hours?

ask.

(45) Is it part of your company's or building owner's policy to follow the ASHRAE Standard 62-1989 regarding the introduction of fresh outdoor air into the ventilation system?

(46) If the answer to question 45 is yes, do you consider the specific type of work environment in determining the appropriate quantity of fresh air to introduce? For example, the ASHRAE recom... is 60 C... (CFM/... person... (47) ... ASHR... minim... thresh... envir... allevi...

(b) ... level ... infor...

(48 ... corre... venti... smok...

(49 ... acce...

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smoke in indoor air, how would you maintain this level in your building? What ventilation rate would be appropriate to solve this PTS problem?

(50)(a) Have you found that redesigning the workplace interior (e.g., ... renovation), leaving the ventilation ... alone, results in improper ... ution of air?

... f so, what types of problems ... after the remodeling?

ASHRAE set its recommendations ... ing 100% fresh outdoor air ... duction, but states that properly ... d, recirculated air at the same ... rates will adequately remove ... minants to acceptable levels. Do you agree with this statement?

... If yes, please provide information which supports recirculating filtered air as a healthy alternative to 100% fresh air introduction.

(c) If not, what types of problems are associated with recirculated air?

(52)(a) If you recirculate indoor air, do you seasonally adjust the amount of outdoor air your system takes in?

(b) If so, have you observed any trends in illnesses or complaints which parallel the adjustments?

(c) Have you observed any seasonal trends regarding illnesses or complaints independent of adjustment to the system?

(53) Is the current ventilation system the original design or has your company retrofitted a system to improve indoor air quality? — FACT

FAC

(54) Is it possible to mitigate IAQ problems due to bioaerosol contamination just by properly maintaining the ventilation systems in respect to microbial growth, fungal growth, etc.?

(55) What are the operating costs, exclusive of maintenance, for your ventilation system?

(56) What is your average cost per year for maintenance (in terms of ... ad replacement ... e been made to ... on system, why ... what were the ... the mechanical ... rating costs ... nergy and ... after the upgrade? ... ncrease or ... w much? ... arriers have been ... niums of companies ... ntilation systems due ... s by employees ... een adversely ... loor air quality. ... mpany experienced ... nce premium directly or indirectly attributable to poor indoor air quality?

ask

(60) If so, please describe the situation.

The following questions address means of limiting worker exposure to PTS:

(61) If you use smoke reduction methods:

(a) What types do you use?

(b) What is the yearly cost of the program (1) per employee and (2) per cubic foot of workplace space?

(62) If smoking is allowed in indoor work areas, what should be done to assure that nonsmokers are protected from exposure to PTS?

(63) In your opinion, should smoking control policies differ for different types of workplaces (e.g., factories, offices, stores, restaurants)? If your answer is yes, please state your reasons why you believe this.

(64)(a) If your company confines smoking to designated areas, is the ventilation in such areas mixed with outside air and distributed to nonsmoking areas?

(b) Has monitoring ever been conducted to determine the transfer of smoke constituents from the designated smoking areas to nonsmoking areas? If so, can you supply the results or describe them.

(65) In companies that allow smoking throughout the workplace, describe what, if anything, is done to reduce nonsmoker's exposure to PTS?

(66)(a) In your experience or opinion, is it feasible to reduce PTS contaminant levels to adequate levels just by increasing ventilation?

(b) If so, are costs in equipment and maintenance any different than those required for maintaining good indoor air quality?

(c) If the answer to (b) is yes, what is the cost difference?

(11) Smoking policy

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(1) ... monitoring

(2) ... air standards - Ashrae

(3) ... analogs

(4) ... contaminants ... water

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IAQ policy

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biomarkers in biological tissues that are associated with specific levels of exposure to nicotine in PTS?

(37)(a) What is the relationship between inhaled nicotine and cotinine levels in body fluids?

(b) How does this relationship differ for smokers versus nonsmokers?

(38) Are there identifiable biological markers for cumulative exposure which would facilitate investigation of chronic diseases associated with exposure to PTS?

(39)(a) In workplaces where a restricted smoking policy has been implemented, has monitoring and evaluation been performed to determine its effectiveness in reducing levels of PTS components?

(b) If so, what substances are monitored?

(c) How is this monitoring conducted and how frequently is the policy evaluated?

The following questions deal with radon as an indoor air pollutant:

(40) Have you ever monitored for radon in your workplace?

(41) If you have:

(a) Why did you?

(b) Who did the monitoring?

(c) What was the resulting radon level?

(d) Where was the monitoring done (basement, main floor, higher floors)?

(e) What type of monitoring was used (alpha track, charcoal, etc.)? How much did the monitoring cost?

(f) Over what period of time did monitoring take place?

(g) How long was each momtor left in place?

Controls

(42) Some citations in the literature state that the primary source of bacteria released into the indoor environment is the human body. Has your workplace addressed spatial considerations to prevent overcrowding, and thus reduce the person to person spread of disease? How did you do this?

(43) Do you have evidence to show that overcrowding is a source of bioaerosol formation?

(44) Do you increase ventilation flow in particularly crowded worksites or conversely reduce ventilation during non-work hours?

ask. (45) Is it part of your company's or building owner's policy to follow the ASHRAE Standard 62–1989 regarding the introduction of fresh outdoor air into the ventilation system?

(46) If the answer to question 45 is yes, do you consider the specific type of work environment in determining the appropriate quantity of fresh air to introduce? For example, the ASHRAE recommended level for smoking lounges is 60 Cubic Feet per Minute per person (CFM/person) as opposed to 20 CFM/person for regular office space.

(47)(a) If you do not follow the ASHRAE guidelines, do you believe one minimum acceptable CFM/person threshold exists for all indoor work environments which would successfully alleviate all health effects?

(b) What would you recommend that level to be? Please provide supporting information.

(48) What data are available correlating PTS concentrations to ventilation rates and density of smokers?

(49) If you believe there is an acceptable level of passive tobacco smoke in indoor air, how would you maintain this level in your building? What ventilation rate would be appropriate to solve this PTS problem?

(50)(a) Have you found that redesigning the workplace interior (e.g., as in renovation), leaving the ventilation system alone, results in improper distribution of air?

(b) If so, what types of problems ensue after the remodeling?

(51) ASHRAE set its recommendations assuming 100% fresh outdoor air introduction, but states that properly filtered, recirculated air at the same flow rates will adequately remove contaminants to acceptable levels.

(a) Do you agree with this statement?

(b) If yes, please provide information which supports recirculating filtered air as a healthy alternative to 100% fresh air introduction.

(c) If not, what types of problems are associated with recirculated air?

(52)(a) If you recirculate indoor air, do you seasonally adjust the amount of outdoor air your system takes in?

(b) If so, have you observed any trends in illnesses or complaints which parallel the adjustments?

(c) Have you observed any seasonal trends regrading illnesses or complaints independent of adjustment to the system?

(53) Is the current ventilation system the original design or has your company retrofitted a system to improve indoor air quality? – FACT

End

(54) Is it possible to mitigate IAQ problems due to bioaerosol contamination just by properly maintaining the ventilation systems in respect to microbial growth, fungal growth, etc.?

(55) What are the operating costs, exclusive of maintenance, for your ventilation system?

(56) What is your average cost per year for maintenance (in terms of cleaning, repairing, and replacement parts)?

ask

(57) If changes have been made to upgrade the ventilation system, why were they made and what were the costs associated with the mechanical improvements?

(58)(a) Did the operating costs including those for energy and maintenance change after the upgrade?

(b) If so, did they increase or decrease, and by how much?

Some insurance carriers have been said to increase premiums of companies with inadequate ventilation systems due to potential law suits by employees whose health has been adversely affected by poor indoor air quality.

(59) Has your company experienced an increased insurance premium directly or indirectly attributable to poor indoor air quality?

(60) If so, please describe the situation.

The following questions address means of limiting worker exposure to PTS:

(61) If you use smoke reduction methods:

(a) What types do you use?

(b) What is the yearly cost of the program (1) per employee and (2) per cubic foot of workplace space?

(62) If smoking is allowed in indoor work areas, what should be done to assure that nonsmokers are protected from exposure to PTS?

(63) In your opinion, should smoking control policies differ for different types of workplaces (e.g., factories, offices, stores, restaurants)? If your answer is yes, please state your reasons why you believe this.

(64)(a) If your company confines smoking to designated areas, is the ventilation in such areas mixed with outside air and distributed to nonsmoking areas?

(b) Has monitoring ever been conducted to determine the transfer of smoke constituents from the designated smoking areas to nonsmoking areas? If so, can you supply the results or describe them.

(65) In companies that allow smoking throughout the workplace, describe what, if anything, is done to reduce nonsmoker's exposure to PTS?

(66)(a) In your experience or opinion, is it feasible to reduce PTS contaminant levels to adequate levels just by increasing ventilation?

(b) If so, are costs in equipment and maintenance any different than those required for maintaining good indoor air quality?

(c) If the answer to (b) is yes, what is the cost difference?

(1) Smoking policy

(1) radon - monitoring
(2) radon air standard - Ashrae
(3) cost analysis
(4) complaints illness reduction

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(67)(a) Is it necessary to use separate ventilation in smoking areas to reduce the possibility of cross-contamination during air recirculation from smoking areas to nonsmoking areas?

(b) If not, explain why cross-contamination of recirculated air is not a problem.

(68)(a) In smoking areas, what types of commercial room air cleaners (e.g., desk top air cleaners, ionizers) other than ventilation are used to reduce levels of PTS?

(b) How do you know they are effective in removing smoke from the air?

(c) List other commercial air cleaners which are effective in removing PTS-related gases and particulates from the ambient air.

ASHRAE has specified a series of recommended indoor air quality standards to control common indoor contaminants. Commonly mentioned control techniques other than increasing ventilation flow include product improvement (e.g., lead-free paint), filters and electrostatic precipitators (for particulates), and absorbing charcoal beds (to remove gaseous contaminants).

FACT → (69) Have you employed any of these devices or techniques to improve overall air quality inside your facility?

(70) If yes, please describe the devices or techniques that you have employed?

(71)(a) If you believe that OSHA should adopt the ASHRAE standards for controlling occupational exposures to indoor air contaminants, please provide any quantitative information you have to support their effectiveness in improving air quality.

(b) If you do not believe that the ASHRAE standards are sufficient, please recommend what other actions should be taken.

(72) Please estimate what you believe the capital costs would be of incorporating the ASHRAE standard into your building's design and how doing so would affect the cost of renovation projects.

(73) How effective have modifications in ventilation systems and IAQ monitoring been in reducing the number of related illnesses and complaints in your workplace?

(74)(a) Do you have a comprehensive program of regular HVAC system inspection and maintenance?

(b) If so, what does the program consist of?

In order to assist OSHA in developing a more complete profile of existing workplace practices in dealing with hazards associated with poor indoor air quality, comment is requested on the following questions:

(75) How many workers in your workplace are affected by your current policy on indoor air quality?

(a) What type of costs (e.g., capital, operating or maintenance costs) have been involved with voluntarily adopting or changing indoor air quality, including smoking, policies?

(b) Have there been any cost savings (e.g., maintenance, insurance, productivity)?

(c) Are there any options you have considered adopting and have analyzed, but have not yet adopted (including ones that have been rejected)?

(d) What are they, what costs and benefits have you identified with them, and why have you not yet adopted them?

(e) What is the nature of your business?

(f) What is the size of the workforce at your establishment?

(76)(a) How have personnel relationships been affected by workplace policies related to indoor air quality, especially smoking? → stalk arrangements

(b) Have there been any quantifiable benefits in this area related to the implementation of new indoor air quality policies? Santiago data

(77) If your company allows smoking in indoor areas, please state any restrictions that may apply:

(a) Is smoking restricted to designated smoking areas?

(b) Is smoking restricted during certain times?

(c) Are other restrictions enforced (if so, please state what they are)?

(78) In your opinion or from your experience, are there specific workplaces where it would not be feasible to comply with a standard that consists of any of the following:

(a) smoking in designated areas only,

(b) smoking in a designated area with separate ventilation,

(c) limited exposure to specific levels of PTS components, or

(d) a total smoking ban in indoor work areas?

(79) If your company has developed and implemented a smoking control policy:

(a) What conditions existed that prompted this action?

(b) Did the development and implementation of a successful smoking policy involve broad participation? For example, did the groups that participated include: management, union representatives, employees, smokers and nonsmokers?

(c) With regard to current policy in your workplace, how many workers are affected by the policy?

(d) What has been the effect of any smoking restriction on smoker behavior?

(80)(a) Once a policy was implemented, did you provide smokers with information and access to non-coercive stop-smoking aids, such as smoking cessation clinics, counseling and self-help materials?

(b) If you did, was it effective in helping smokers to quit?

(81)(a) What means do you use to enforce the policy?

(b) Do you use signs to post designated smoking areas?

(82) In the experience of companies that have implemented smoking control policies:

(a) Have costs of implementing and monitoring the policy been estimated?

(b) What are these costs?

(83) If you are a private sector employer, did you consider a smoking control policy in order to reduce potential liability?

(84) If your company has been involved in smoking-related litigation, have you initiated smoking control policies to reduce the possibility of further litigation?

(85) If, as a result of monitoring for radon, you determined that action was required to reduce the level:

(a) What action was taken?

(b) Was monitoring performed subsequent to abatement action?

(c) To what extent did the abatement change the levels?

(d) What was the cost of such mitigation?

Local Policies and Practices

(86)(a) In your local area (municipality or State) how many establishments have voluntarily established indoor air policies?

(b) What do these policies entail?

(c) Do these policies vary between types of businesses?

(d) Why were these policies adopted?

(87)(a) Are businesses facing legal pressure to implement general clean indoor air policies?

(b) What legal problems have been encountered when establishments have attempted to establish or modify indoor air quality policies?

Where states or localities have decided to regulate smoking in the workplace:

(88) OSHA requests that copies of state or local smoking rules, regulations, or guidelines be submitted.

(a) Why were certain types of workplaces included in the above but others omitted?

(b) Please identify sections of this rule, regulation, or guideline that are different for certain types of employers or conditions of employment (e.g., restaurants, private offices, and

- Standards - policies

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factories) as compared to others (e.g., general office space and public space).

(c) Are structural changes in the ventilation system or the building of barriers between smoking and nonsmoking sections ever a specified option for employers in attempting to comply with the rule, regulation, or guideline?

(89) Have there been any difficulties in implementing, monitoring, enforcing, and evaluating the effectiveness of these rules, regulations, or guidelines in reducing exposure of nonsmokers to PTS?

(90)(a) Has compliance with these various rules, regulations, or guidelines been measured? If so, how?

(b) Have these various rules, regulations, or guidelines been effective in reducing the amount of PTS in various workplaces?

(c) What sort of violations are you experiencing?

(d) What are the penalties for noncompliance?

(e) What type of resources are being used to ensure compliance with the rule, regulation, or guideline?

(91) In the workplace experience, what costs or savings have resulted in your complying with the rule, regulation, or guideline?

Potential Content of Regulation

(92) If OSHA determines, on the basis of adequate evidence, that regulatory action is needed to protect employees from adverse health effects related to indoor air quality, what elements do you believe such regulation should include? Please provide the basis for your suggested element(s).

III. References

The studies and other data listed below are referred to in this document. These references, designated as Exhibit 2-1—2-8 of Docket Number H-122, are available for examination and copying at the OSHA Docket Office, room N-2625, U.S. Department of Labor, Washington, DC 20210, between 10 am and 4 pm, Monday through Friday, legal holidays excepted.

1. American Society of Heating and Refrigerating and Air-Conditioning Engineers (ASHRAE). 1989. *ASHRAE 62-1989. ASHRAE Standard: Ventilation for Acceptable Indoor Air Quality.* ASHRAE, Inc. Atlanta, Georgia. ISSN 1041-2336.

2. Calabrese, E. 1978. *Pollutants and High-Risk Groups: The Biological Basis of Increased Human Susceptibility to Environmental and Occupational Pollutants.* John Wiley and Sons, New York.

3. Cummings, M., Markello, S., Mahoney, M., Bhargava, A., McElroy, P., and Marshall, J. 1990. Measurement of current exposure to environmental tobacco smoke. Arch. Environ. Health 45(2):74-79.

4. Glantz, S. and Parmley, W. 1991. Passive smoking and heart disease: Epidemiology, physiology, and biochemistry. Circulation 83(1):1-11.

5. National Institute for Occupational Safety and Health (NIOSH). 1987. Guidance for Indoor Air Quality Investigations. Hazard Evaluations and Technical Assistance Branch, Division of Surveillance, Hazard Evaluations and Field Studies, Cincinnati, Ohio. NIOSH-00174355. 25 Pages.

6. Repace, J. and Lowrey, A. 1985. A quantitative estimate of nonsmokers' lung cancer risk from passive smoking. Environ Int. 11:3-22.

7. Tager, I. 1989. Health effects of involuntary smoking in the workplace. N.Y. State J. Med. 89(1):27-31.

8. Woods, J. 1989. Cost avoidance and productivity in owning and operating buildings. In: Cone, J. and Hodgson, M. (eds): *Problem Buildings: Building-associated Illness and the Sick Building Syndrome.* Occup. Med. State of Art Rev. 4:753-770.

IV. Authority and Signature

This document was prepared under the direction of Gerard F. Scannell, Assistant Secretary for Occupational Safety and Health, U.S. Department of Labor, 200 Constitution Avenue, NW., 20210. It is issued pursuant to section 6(b) of the Occupational Safety and Health Act of 1970 (84 stat. 1593; 29 U.S.C. 655).

Signed at Washington, DC, this 16th day of September 1991.

Gerard F. Scannell,

Assistant Secretary of Labor.

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OSHA RFI THEMES

Exposure to ETS:

OSHA RFI: 2a(iii), 24, 35

1. Studies of ETS exposures in the workplace, public places and public transportation [illegible] smoker exposure to ETS is minimal.

References:

Sterling, T., et al., "In [illegible] acco Smoke: A Critical Review [illegible] llut Control Assoc 32(3): 250-2[illegible]

Sterling, T., et al., "Envir [illegible] loor Air Quality in Modern Offic[illegible] Med 29(1): 57-62, 1987.

Adlkofer, F. "Biological Effe[illegible] In: Indoor Air Quality. Buenos [illegible] Academy of Sciences of Buenos Aires, 61-[illegible], 1989.

Kirk, P., et al., "Environmental Tobacco Smoke in Indoor Air." In: Indoor and Ambient Air Quality. R. Perry and P. Kirk (eds.). London, Selper Ltd., 99-112, 1988.

Carson, J. and Erikson, C., "Results from Survey of Environmental Tobacco Smoke in Offices in Ottawa, Ontario," Environ Technol Letters 9: 501-508, 1988.

Oldaker, G., et al., "Results From Surveys of Environmental Tobacco Smoke in Restaurants." In: Indoor Air Quality, H. Kasuga (ed.). Berlin, Heidelberg, Springer-Verlag, 99-104, 1990.

Sterling, T. and Mueller, B., "Concentrations of Nicotine, RSP, CO and CO_2 in Nonsmoking Areas of Offices Ventilated by Air Recirculated from Smoking Designated Areas," Am Ind Hyg Assoc J 49(9): 423-426, 1988.

Oldaker, G. and Conrad, F., "Estimation of the Effect of Environmental Tobacco Smoke on Air Quality Within Passenger Cabins of Commercial Aircraft," Environ Sci Technol 21: 994-999, 1987.

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Dissertation

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OSHA RFI THEMES

Exposure to ETS:

OSHA RFI: 2a(iii), 24, 35

1. Studies of ETS exposures in the workplace, public places and public transportation reveal that typical nonsmoker exposure to ETS is minimal.

References:

Sterling, T., et al., "Indoor Byproduct Levels of Tobacco Smoke: A Critical Review of the Literature," J Air Pollut Control Assoc 32(3): 250-259, 1982.

Sterling, T., et al., "Environmental Tobacco Smoke and Indoor Air Quality in Modern Office Work Environments," J Occup Med 29(1): 57-62, 1987.

Adlkofer, F. "Biological Effects After Exposure to ETS." In: Indoor Air Quality. Buenos Aires, The National Academy of Sciences of Buenos Aires, 61-78, 1989.

Kirk, P., et al., "Environmental Tobacco Smoke in Indoor Air." In: Indoor and Ambient Air Quality. R. Perry and P. Kirk (eds.). London, Selper Ltd., 99-112, 1988.

Carson, J. and Erikson, C., "Results from Survey of Environmental Tobacco Smoke in Offices in Ottawa, Ontario," Environ Technol Letters 9: 501-508, 1988.

Oldaker, G., et al., "Results From Surveys of Environmental Tobacco Smoke in Restaurants." In: Indoor Air Quality, H. Kasuga (ed.). Berlin, Heidelberg, Springer-Verlag, 99-104, 1990.

Sterling, T. and Mueller, B., "Concentrations of Nicotine, RSP, CO and CO_2 in Nonsmoking Areas of Offices Ventilated by Air Recirculated from Smoking Designated Areas," Am Ind Hyg Assoc J 49(9): 423-426, 1988.

Oldaker, G. and Conrad, F., "Estimation of the Effect of Environmental Tobacco Smoke on Air Quality Within Passenger Cabins of Commercial Aircraft," Environ Sci Technol 21: 994-999, 1987.

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RFI: 3

2. Only 2-4% of complaints from occupants in buildings investigated for sick building syndrome have been related to tobacco smoke exposures. Over half of the buildings investigated were found to have inadequate ventilation. Tobacco smoke is often initially identified as the cause of complaints about indoor air quality because it is easily seen and smelled. Actually, "hanging" tobacco smoke may indicate an underlying problem; namely, inadequate ventilation.

References:

Melius, J., et al., "Indoor Air Quality -- the NIOSH Experience," Ann Am Conf Gov Ind Hyg 10: 3-7, 1984.

Robertson, G., "Source, Nature and Symptomology on Indoor Air Pollutants." In: Indoor and Ambient Air Quality. R. Perry and P. Kirk (eds.). London, Selper Ltd., 311-319, 1988.

Kirkbride, J., Sick Building Syndrome: Causes and Effects, Health and Welfare Canada, Ottawa, Canada, October 24, 1985.

Collett, C. et al., "A Database of Problem Buildings: Learning by Past Mistakes." In: Present and Future of Indoor Air Quality. C. Bieva, et al. (eds.). Amsterdam, Elsevier Science Publishers, 413-419, 1989.

U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, Division of Standards Development and Technology Transfer, "The NIOSH Approach to Conducting Indoor Air Quality Investigations in Office Buildings," Indoor Air Quality Selected References, September, 1989.

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Health Effects:

RFI: 2a(iii), 11

1. While some individuals may report annoyance or irritation in the presence of ETS, scientific data do not conclusively support the claim that ETS exposure is associated with an increased risk of disease in nonsmokers. Indeed, studies report mixed results on the possible association of ETS exposure and the exacerbation of allergies, asthma, etc.

References:

Lehrer, S., et al., "Tobacco Smoke Sensitivity: A Result of Allergy?," Ann Allergy 56: 1-10, 1986.

Bylin, G., "Tobaksallergi -- finns den? (Tobacco Allergy -- Does It Exist?)," Lakartidningen 77(16): 1530-1532, 1980. Translation.

Stankus, R. and S. Lehrer, "Inhalation Challenge Studies on Tobacco Smoke Sensitive Asthmatics." In: Indoor and Ambient Air Quality. R. Perry and P. Kirk (eds.). London, Selper Ltd., 303-304, 1988.

Salvaggio, J., Statement, U.S. Congress Committee on Agriculture, Subcommittee on Tobacco, Effect of Smoking on Nonsmokers, Hearing, 95th Congress, 2nd Session, Washington, D.C., U.S. Government Printing Office, 46-49, September 7, 1978.

Shephard, R.J., Collins, R. and Silverman, F., "'Passive' Exposure of Asthmatic Subjects to Cigarette Smoke," Environmental Research 20: 392-402, 1979.

Wiedemann, H.P., Mahler, D.A., Loke, J., Virgulto, J.A., Snyder, P. and Matthay, R.A., "Acute Effects of Passive Smoking on Lung Function and Airway Reactivity in Asthmatic Subjects," Chest 89(2): 180-184, 1986.

Stankus, R.P., Menon, P.K., Rando, R.J., Glindmeyer, H., Salvaggio, J.E. and Lehrer, S.B., "Cigarette Smoke-Sensitive

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Asthma: Challenge Studies," Journal of Allergy and Clinical Immunology 82: 331-338, 1988.

Lebowitz, M., "The Effects of Environmental Tobacco Smoke Exposure and Gas Stoves on Daily Peak Flow Rates in Asthmatic and Non-Asthmatic Families." In: ETS-Environmental Tobacco Smoke: Report from a Workshop on Effects and Exposure Levels.

R. Rylander, Y. Peterson, M.-C. Snella (eds.). Published simultaneously in European Journal of Respiratory Diseases, Supplement No. 133, Vol. 65, 90-97, 1984.

RFI: 11, 12

2. Various governmental health agencies have designated tobacco smoke as a human carcinogen. However, ETS is not tobacco smoke per se, and chemists have determined that ETS is different in both quality and quantity than the smoke of the active smoker. Not one of the substances identified in ETS as "potentially carcinogenic" has induced lung cancer by inhalation in experimental animals.

References:

Baker, R., et al., "The Origins and Properties of Environmental Tobacco Smoke," ENV Int (16): 231-245, 1990.

Proctor, C., et al., "The Measurement of ETS Through Adsorption/Desorption Procedures." In: Indoor Air Quality. H. Kusaga (ed.). Berlin, Heidelberg, Springer-Verlag, 82-89, 1990.

Gori, G. and N. Mantel, "Mainstream and Environmental Tobacco Smoke," Regulatory Toxicology and Pharmacology 14: 88-105, 1991.

Aviado, D., "Suspected Pulmonary Carcinogens in Environmental Tobacco Smoke," Environ Tech Letters, 9: 539-544, 1988.

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Aviado, D., "Health Effects of 50 Selected Constituents of Environmental Tobacco Smoke." In: Indoor Air Quality. H. Kasuga (ed.). Berlin, Heidelberg, Springer-Verlag, 383-389, 1990.

Smoking Policies:

RFI: 39, 62-67, 78

1. Some have claimed that the only way to minimize exposures to ETS in the workplace is through a smoking ban or through a specially isolated and ventilated smoking room. However, a number of scientific studies on ETS levels in the workplace reveal that simple separation of smokers and nonsmokers effectively minimizes nonsmoker exposure to ETS.

References:

Vaughan, W. and Hammond, K., "Impact of 'Designated Smoking Area' Policy on Nicotine Vapor and Particle Concentrations in a Modern Office Building," J Air Waste Manage Assoc 40: 1012-1017, 1990.

Hedge, A., et al., "Building Ventilation and Smoking Policy Effects on Indoor Air Quality and Employee Comfort and Health." In: Indoor Air '90: Proceedings of the Fifth International Conference on Indoor Air Quality and Climate. Toronto, Canada, Volume 1, 739-744, July 29-August 3, 1990.

Sterling, T. and Mueller, B., "Concentrations of Nicotine, RSP, CO and CO_2 in Nonsmoking Areas of Offices Ventilated by Air Recirculated from Smoking Designated Areas," Am Ind Hyg Assoc J 49(9): 423-426, 1988.

Sterling, T., et al., "Exposure to Environmental tobacco Smoke in the Non Industrial Workplace Under Different Conditions of Ventilation and Smoking Regulation." In: Present and Future of Indoor Air Quality. C.J. Bieva, et al. (eds.). Elsevier Science Publishers, Amsterdam, 111-118, 1989.

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Oldaker, G., et al., "Estimation of Effect of Environmental Tobacco Smoke on Air Quality Within Passenger Cabins of Commercial Aircraft II." In: Indoor Air Quality and Ventilation, F. Lunau and G. Reynolds (eds.). London, Selper Ltd., 447-454, 1990.

Sterling, T. and Mueller, B., "Concentrations of Nicotine, RSP, CO and CO_2 in Nonsmoking Areas of Offices Ventilated by Air Recirculated from Smoking Designated Areas," Am Ind Hyg Assoc J 49(9): 423-426, 1988.

Oldaker, G., et al., "Results From Surveys of Environmental Tobacco Smoke in Restaurants," Indoor Air Quality, ed. H. Kasuga, Springer-Verlag, Berlin Heidelberg: 99-104, 1990.

RFI: 78, 63

2. Workplace environments vary greatly and smoking policies should be designed to fit the requirements of individual workplaces. In some workplaces with adequate ventilation, a smoking policy would serve no real purpose. Accommodation of smokers and nonsmokers should be the overriding consideration in drafting and implementing a workplace smoking policy.

Ventilation:

RFI: 45, 49, 71, 72, 73

1. A voluntary standards writing organization has developed a ventilation standard which is currently being adopted by various building code organizations and municipalities throughout the U.S. This standard, called ASHRAE 62-1989, recommends ventilation rates to ensure adequate indoor air quality. The standard assumes the presence of smokers and the ventilation rates are recommended to deal with smoking and other substances in the

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indoor air. The standard has been effective, and its implementation costs are minimal.

2. Inadequate ventilation is the most significant cause of complaints in sick buildings.

References:

American Society of Heating, Refrigerating and Air-Conditioning Engineers, "ASHRAE Standard 62-1989, Ventilation for Acceptable Indoor Air Quality," Atlanta, ASHRAE Publications, 1989.

Goodfellow, H. and J. Wyatt, "Critical Review of Ventilation Contaminants in Indoor Air." In: Indoor Air Quality and Ventilation. F. Lunau and G. Reynolds (eds.). London, Selper Ltd., 95-104, 1990.

Binnie, P., "The Role of Ventilation in Controlling the Quality of Indoor Air, Including ETS." In: Other Peoples's Tobacco Smoke. A. Armitage (ed). Beverly, East York, United Kingdom, Galen Press, 159-172, 1991.

Burroughs, H., "ASHRAE: Addressing the Indoor Air Quality Challenge With Energy Conscious Design." In: Indoor and Ambient Air Quality. R. Perry and P. Kirk (eds.). London, Selper Ltd., 530-535, 1988.

3. A smoking ban as a single solution to improving indoor air quality does not address the issues of inadequate ventilation and the potential buildup of invisible airborne substances. On the other hand, a uniform ventilation standard would address all substances in the indoor environments.

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Chemicals in Indoor Air:

OSHA RFI: 2a(i), 25, 26

1. A number of scientific studies have reported adverse health effects of indoor nitrogen dioxide exposure from unvented combustion sources such as gas stoves and heaters. The reported symptoms are similar to those reported among occupants of "sick buildings."

References:

Utell, M.J., Frampton, M.W., Roberts, N.J., Finkelstein, J.N., Cox, C., Morrow, P.E., "Mechanisms of Nitrogen Dioxide Toxicity in Humans," Health Effects Research Institue Report Number 43, 1-44, 1990.

Tokiwa, H., Nakagawa, R., Horikawa, K., Ohkubo, A., "The Nature of the Mutagenicity and Carcinogenicity of Nitrated, Aromatic Compounds in the Environment," Environmental Health Perspectives 73: 191-199, 1987.

Traynor, G.W., Girman, J.R., Apte, M.G., Dillworth, J.F., White, P.D. "Indoor Air Pollution Due to Emissions from Unvented Gas-Fired Space Heaters," Journal of the Air Pollution Control Association 35: 231-237, 1985.

Davidson, C.I., Lin, S.F., Osborn, J.F., Pandey, M.R., Rasmussen, R.A., Khalil, M.A.K. "Indoor and Outdoor Air Pollution in the Himalayas," Environmental Science Technology 20(6): 561-567, 1986.

Wageniengen, N. van, Wagemaekers, M., Fugas, M. "A Pilot Study on Indoor Air Quality. A Health Effects Oriented Approach," Arh. hig. rada toksikol. 37: 413-422, 1986.

Lebowitz, M., Dodge, R., Holberg, C., Corman, G., Boyer, B., "Daily Symptoms Related to Indoor Pollution in Adult Asthmatics and Non-Asthmatics," American Journal of Epidemiology 118(3): 419, 1983.

Harrison, R.M., Colbeck, I., Simmons, A., "Comparative Evaluation of Indoor and Outdoor Air Quality: Chemical

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Considerations," Environmental Toxicology Letters 9(0): 521-530, 1988.

Graham, J.A., Miller, F.J., "Indoor Air and Human Health. Part Four. Combustion Products: 21. Interferences with Lung Defenses by Nitrogen Dioxide Exposure," Oak Ridge National Laboratory Life Sciences Symposium 0(7): 279-296, 1985.

2. A number of studies have reported adverse health effects of indoor exposure to volatile organic compounds (VOCs) that are compatible with those effects reported among occupants of "sick buildings." Sources of VOCs in the indoor environment include cleaning products, floor wax, latex paints, and reentrained motor vehicle exhaust.

References:

Sterling, T.D., Arundel, A., "Possible Carcinogenic Components of Indoor Air Combustion Byproducts, Formaldehyde, Minderal Fibers, Radiation, and Tobacco Smoke," Journal of Environmental Science and Health C2(2): 185-230, 1984.

Meyer, B., "Formaldehyde Exposure From Building Products," Environment International 12: 283-288, 1986.

Tancrede, M., Wilson, R., Zeise, L., Crouch, E.A.C., "The Carcinogenic Risk of Some Organic Vapors Indoors: A Theoretical Survey," Atmospheric Environment 21(10): 2187-2205, 1987.

Hawthorne, A.R., Gammage, R.B., "Formaldehyde Release from Simulated Wall Panels Insulated with Urea-Formaldehyde Foam Insulation," Journal of the Air Pollution Control Association 32(11): 1126-1131, 1982.

Witek, T.J., Schachter, E.N., Tosun, T., Leaderer, B.P., Beck, G.J., "Controlled Human Studies on the Pulmonary Effects of Indoor Air Pollution: Experiences with Sulfur Dioxide and Formaldehyde," Environment International 12(1/4): 129-135, 1986.

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Noma, E., Berglund, B., Berglund, U., Johansson, I., Baird, J.C., "Joint Representation of Physical Locations and Volatile Organic Compounds in Indoor Air from a Healthy and a Sick Building," Atmospheric Environment 22(3): 451-460, 1988.

Liu, K.S., Huang, F.Y., Hayward, S.B., Wesolowski, J., Sexton, K., "Irritant Effects of Formaldehyde Exposure in Mobile Homes," Environmental Health Perspectives 94: 91-94, 1991.

3. Scientific studies have reported adverse health effects related to indoor exposure to carbon monoxide from unvented combustion sources such as stoves and heaters. The health problems associated with carbon monoxide exposure are consistent with those associated with "sick building syndrome."

References:

Grot, R.A., Hodgson, A.T., Daisey, J.M., Persily, A., "Indoor Air Quality Evaluation of a New Office Building," ASHRAE Journal 33(9): 16-25, 1991.

Traynor, G.W., Girman, J.R., Apte, M.G., Dillworth, J.F., White, P.D., "Indoor Air Pollution Due to Emissions from Unvented Gas-Fired Space Heaters," Journal of the Air Pollution Control Association 35: 231-237, 1985.

Traynor, G.W., Apte, M.G., Carruthers, A.R., Dillworth, J.F., Grimsrud, D.T., Gundel, L.A., "Indoor Air Pollution Due to Emissions from Wood-Burning Stoves," Environmental Science Technology 21(7): 691-697, 1987.

4. Scientific studies have reported adverse health effects, such as those associated with "sick building syndrome," amongst people exposed to ozone in the indoor environment.

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References:

Adams, M.S., Tiller, C., Cass, G.R., "The Measurement and Model Predictions of Indoor Ozone Concentrations in Museums," Atmospheric Environment 24A(7): 1813-1823, 1990.

5. Adverse health effects due to indoor exposure to airborne mineral fibers have been reported in the scientific literature.

References:

Sterling, T.D., Arundel, A., "Possible Components of Indoor Air Combustion Byproducts, Formaldehyde, Mineral Fibers, Radiation, and Tobacco Smoke," Journal of Environmental Science and Health C2(2): 185-230, 1984.

Multiple Chemical Sensivity

OSHA RFI: 7, 8

1. There are an increasing number of people who claim to have developed "multiple chemical sensitivity" or MCS. These people claim hypersensitivity to almost every environmental substance, including hairspray, perfume, VOCs, ozone and ETS. Cases are generally reportedly due to an "extremely high" level of exposure to a given substance in the indoor or outdoor environment. The levels indicated in these "extremely high" exposures are substantially higher than the level to which people are exposed to ETS constituents in the indoor environment.

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Furthermore, scientists have been unable to find an allergenic component in environmental tobacco smoke.

References:

Cullen, M.R., "The Worker with Multiple Chemical Sensitivities: An Overview," Occupational Medicine: State of the Art Reviews 2(4): 655-661, 1987.

Mooser, S.B., "The Epidemiology of Multiple Chemical Sensitivities," Occupational Medicine: State of the Art Reviews 2(4): 663-667, 1987.

Levin, A.S., Byers, V.S., "Environmental Illness: A Disorder of Immune Regulation," Occupational Medicine: State of the Art Reviews 2(4): 669-681, 1987.

Terr, A.I., "'Multiple Chemical Sensitivities:' Immunologic Critique of Clinical Etiology Theories and Practice," Occupational Medicine: State of the Art Reviews 2(4): 683-694, 1987.

Brodsky, C.M., "Multiple Chemical Sensitivities and Other 'Environmental Illness': A Psychiatrist's View," Occupational Medicine: State of the Art Reviews 2(4): 695-704, 1987.

Sparer, J., "Environmental Evaluation of Workers with Multiple Chemical Sensitivities: An Industrial Hygienist's View," Occupational Medicine: State of the Art Reviews 2(4): 705-712, 1987.

Galland, L., "Biochemical Abnormalities in Patients with Multiple Chemical Sensitivities," Occupational Medicine: State of the Art Reviews 2(4): 713-720, 1987.

Cone, J.E., Harrison, R., Reiter, R., "Patients with Multiple Chemical Sensitivities: Clinical Diagnostic Subsets Among an Occupational Health Clinic Population," Occupational Medicine: State of the Art Reviews 2(4): 721-738, 1987.

Cullen, M.R., "Multiple Chemical Sensitivities: Summary and Directions for Future Research," Occupational Medicine: State of the Art Reviews 2(4): 801-804, 1987.

Hileman, B., "Multiple Chemical Sensitivity," Chemical and Engineering News, pp. 26-42, 1991.

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Bioaerosols:

RFI: 2a(ii), 5, 6, 17, 32, 33, 42, 54

1. Scientific evidence suggests that bioaerosols (e.g., mold spores, bacteria, dust mites, etc.) in indoor air may be related to such conditions as upper respiratory tract infection, eye irritation, headache, allergy, "building-related illness," and hypersensitivity pneumonitis.

2. It has been reported in the scientific literature that proper design, operation and maintenance of HVAC systems can prevent the build-up of bioaerosols.

References:

Bardana, E.J., et al., "Building-Related Illness: A Review of Available Scientific Data," Clinical Reviews in Allergy 6: 61-89, 1988.

Burge, H., "Bioaerosols: Prevalence and Health Effects in the Indoor Environment," The Journal of Allergy and Clinical Immunology 86(5): 687-701, 1990.

Burge, H. A., "Risks Associated with Indoor Infectious Aerosols," Toxicology and Industrial Health 6(2):263-274, 1990.

Elixmann, J.H., et al., "Can Airborne Fungal Allergens Pass Through an Air-Conditioning System?," Environment International 15: 193-196, 1989.

Hedge, A., et al., "Breathing-Zone Filtration Effects on Indoor Air Quality and Sick Building Syndrome Complaints," In: IAQ '91: Healthy Buildings, ASHRAE, Atlanta, 351-357, 1991.

Morey, P.R., "Experience on the Contribution of Structure to Environmental Pollution," In: Architectural Design and Indoor Microbial Pollution, ed. R.B. Kundsin, Oxford University Press, New York, 40-80, 1988.

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Schata, M., et al., "Allergies to Molds Caused by Fungal Spores in Air Conditioning Equipment," Environment International 15: 177-179, 1989.

Legionnaires' disease:

RFI: 5b

1. Legionella bacteria can become concentrated in water in improperly maintained humidifiers, air conditioner drain pans and the like. When the system is operated, the bacteria can be spread throughout the building. Exposure to these bacteria may result in Legionnaire's disease, a sometimes fatal pneumonia, in susceptible individuals.

References:

Imperato, P.J., "Legionellosis and the Indoor Environment," Bull. N.Y. Acad. Med. 57(10): 922-935, 1981.

LaForce, F.M., "Airborne Infections and Modern Building Technology," Environment International 12: 137-148, 1988.

O'Mahony, M., et al., "Legionnaires' Disease and the Sick-Building Syndrome," Epidem. Inf. 103: 285-292, 1989.

O'Sullivan, P., "Control of Legionnaires' Disease," In: indoor and Ambient Air Quality, eds. R. Perry and P.W. Kirk, Selper, Ltd., London, 479-488, 1988.

Radon:

RFI: 2a(iv), 40, 41

1. Studies of underground miners suggest that exposure to radon gas increases the risk of lung cancer. Elevated radon levels have been reported in some homes. Extrapolation from the

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miner data suggests that home or workplace exposure to radon may increase the risk of lung cancer.

2. Radon arises from the soil, water or building materials. Some researchers suggest that increased ventilation can reduce indoor radon levels.

References:

Abu-Jarad, F. and Fremlin, J.H., "The Activity of Radon Daughters in High-Rise Buildings," Health Physics 43(1): 75-80, 1982.

Cohen, B.L., et al., "Radon Concentrations Inside Public and Commercial Buildings in the Pittsburgh Area," Health Physics 47(3): 399-405, 1984.

Guilmette, R.A., et al., "Risks from Radon Progeny Exposure: What We Know, and What We Need to Know," Annu. Rev. Pharmacol. Toxicol. 31: 569-601, 1991.

Hewitt, C.N. and Kelly, M., "Environmental Radon: A Brief Review," Environmental Technology 11: 387-392, 1990.

Maher, E.F., et al., "Effective Removal of Airborne 222-Rn Decay Products Inside Buildings," Health Physics 53(4): 351-356, 1987.

Mullen, R.M. and Nevissi, A.E., "Home Weatherization and Its Effects on Indoor 222-Rn Levels," Health Physics 59(2): 211-215, 1990.

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DRAFT

OSHA - PM
Submitted

PHILIP MORRIS RESPONSE TO OSHA RFI

GLOSSARY

The attached glossary of scientific terms is provided for the reader's reference.

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DRAFT

GLOSSARY

Acute: Having a short course; of short duration.

Air conditioning: The process of treating air to meet the requirements of a conditioned space by controlling its temperature, humidity, cleanliness and distribution. (After ASHRAE 62-1989.)

Animal study: A controlled laboratory experiment in which animals are exposed to an agent and the biological effects of this exposure are assessed. The exposure may be via food or water (ingestion), by injection, by external application or by inhalation. Typical effects that might be measured are tumor incidence or tissue and organ changes.

Bias: Nonrandom error. Regarding epidemiologic studies, the operation of factors in a study's design or execution that erroneously lead to the appearance of a stronger or weaker association between the agent in question and disease than in fact exists.

Bioassay: The determination of the activity of a sample of an agent by noting its effect on a live animal or an isolated organ preparation.

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Carcinogen: A substance or agent designated as capable of producing or initiating cancer.

Case-control study: A type of epidemiologic study which compares diseased persons (cases) with nondiseased persons (controls) in association with a common exposure to an agent. The previous exposures of both groups are investigated.

Chronic: Persisting over a long period of time. Regarding animal studies, refers to administration of the test substance over a period of several weeks or months.

Cohort study: An epidemiologic study which examines the development of a disease in a group (cohort) of persons who are currently free of the disease. May assess exposure either prospectively or retrospectively.

Confidence interval (CI) and confidence limits: The values between which a risk estimate may be expected to fall 95% of the time based on the variability of the underlying data. When the 95% confidence limits are both greater and less than 1.00 (i.e., the confidence interval includes 1.00), the risk value is considered not statistically significant, i.e., the results are likely to be due to chance and do not support a judgment regarding an association between exposure and disease.

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Confounding: As applied to epidemiologic studies, the situation in which the relationship between an agent and a disease appears stronger or weaker than it truly is due to the influence of another unknown or unrecognized factor. In confounding, the agent under consideration is associated with another agent (a confounding factor, or confounder) which is itself associated with either an increase or decrease in the incidence of the disease.

Dose-response assessment: Defines the relationship between the dose of an agent and the probability of induction of a carcinogenic effect.

Environmental tobacco smoke (ETS) [called "passive tobacco smoke" ("PTS") in the OSHA RFI]: Consists of smoke originating from the smoldering end of a tobacco product between puffs, e.g., sidestream smoke, and of smoke exhaled by the smoker. The components are released into the environment where they are diluted by ambient air and undergo changes related to aging over time.

Epidemiology: The branch of science concerned with the patterns of disease in human populations and the various factors that influence these patterns.

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Flow volume curve: A graphic analysis of the flow generated during an FEV maneuver plotted against volume change, followed by an FIV (forced inspiratory volume) maneuver plotted similarly.

Forced expiratory flow ($FEF_{25-75\%}$): The average rate of flow during the middle half of an FEV maneuver, recorded in liters per second or liters per minute.

Forced expiratory flow ($FEV_{1.0}$): The volume of gas expired over a given time interval (in this instance, one second) of an FVC maneuver.

Forced vital capacity (FVC): The maximum volume of gas that can be expired as forcefully and rapidly as possible after maximal inspiration, recorded in liters.

Gas: A state of matter in which substances exist in the form of nonaggregated molecules. (After ASHRAE 62-1989.)

Hypersensitivity: A state of altered reactivity in which the body reacts with an exaggerated immune response to a foreign substance.

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In vitro: Literally, within glass; used to refer to laboratory procedures conducted in a test tube or similar location, often involving preparations of cells or tissues.

In vivo: Literally, within the living body; used to refer to laboratory procedures utilizing live animals.

Mainstream smoke (MS): Tobacco smoke drawn through the butt end of a cigarette.

Meta-analysis: A statistical technique for combining studies into a single analysis, designed to increase the ability to statistically detect an association if such an association is present.

Microorganism: A microscopic organism, especially a bacterium, fungus or a protozoan. (After ASHRAE 62-1989.)

Mutagen: An agent that tends to increase the frequency or extent of mutation, i.e., physical or biochemical changes in the genetic material of an organism.

Mutagenicity: The property of being able to induce genetic mutation.

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Odds ratio: A measure of risk obtained from epidemiological studies and mathematically close to relative risk.

Odor: A quality of gases, liquids or particles that stimulates the olfactory organ. (After ASHRAE 62-1989.)

Particulate matter: A state of matter in which solid or liquid substances exist in the form of aggregated molecules or particles. (After ASHRAE 62-1989.)

Peak expiratory flow: The maximum flow rate attained at any time during an FEV maneuver, recorded in liters per second or liters per minute.

p-value: A statistical estimate of the probability that a finding is due to chance. By convention, a finding with a p-value less than 5% (i.e., 0.05), or sometimes 1%, is called statistically significant. A p-value less than 0.05 means that the observed results would occur by chance less than 5 times out of 100.

Relative risk: The ratio of the incidence rate of a disease among individuals exposed to a particular risk factor to the incidence rate among unexposed individuals.

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Respirable particles: Ambient particles capable of penetrating into the nonciliated portion of the lung. Particles greater than 10 μm aerodynamic diameter are not respirable. (After ASHRAE 62-1989.) (One μm [micrometer or micron] equals 1/1,000,000 of a meter, or approximately 4/100,000 of an inch.)

Short-term tests: In vitro (performed on cells or tissue cultures) tests for mutations, including tests for chromosome aberrations, DNA damage/repair and other transformations which provide supportive evidence of cellular changes and may give information on carcinogenic mechanisms.

Sidestream smoke (SS): Smoke originating from the smoldering end of a tobacco product between puffs.

Standardized mortality ratio (SMR): A statistical comparison of the number of observed deaths in a study population and the number of expected deaths in a study population.

Statistical significance: A procedure to quantify the probability that an observed outcome, e.g., an association between an exposure and a disease endpoint, arose from random variation alone. The scientific community often uses 5% as a standard level at which data are accepted as occurring other than by

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chance. This means that there is a 95% probability that the results are not attributable to chance.

Syndrome: A set of symptoms which occur together.

Synergistic: Acting together; enhancing the effect of another force or agent.

Toxicology: The scientific study of the adverse effects of chemical or physical agents on biological systems.

Ventilation: The process of supplying and removing air by natural or mechanical means to and from any space. Such air may or may not be conditioned.

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March 18, 1992

Docket Officer
Docket No. H-122
Room N-2625
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Dear Sir or Madam:

Re: Occupational Exposure to Indoor Air Pollutants--Request for Information

Enclosed herewith are comments submitted on behalf of the Philip Morris family of companies (hereinafter Philip Morris or the Company) regarding the above-referenced matter. We appreciate the opportunity to comment in this proceeding and look forward to participation in subsequent rulemaking activities, in the event the Agency determines that such action is warranted.

The Philip Morris submission consists of three parts. First, because of the length of our overall submission, we have provided an Executive Summary of our comments in order to facilitate Agency review. This Executive Summary is appended as an attachment to this transmittal letter. Second, we have provided a response to the OSHA Request for Information (RFI) background section. This response includes a specific section addressing the 1986 Surgeon General's Report, the NIOSH Current Intelligence Bulletin on ETS, the EPA draft risk assessment, and other risk assessments regarding ETS, as well as a glossary of terms used in our response. Third, we have provided substantive comments in response to OSHA RFI Questions 2a(i), 2a(ii), 2a(iii), 2a(iv), 2d, 3, 5, 6, 7, 8, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26a, 26b, 29, 33, 34, 35, 36, 37, 38, 39, 40, 41, 43, 45, 46, 47, 48, 49, 50, 51, 54, 55, 56, 61, 62, 63, 64b, 65, 66, 67, 68, 71a, 72, 73, 74, 75a, 75b, 76, 78, 85a, 88, 89, and 92.

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March 18, 1992

Docket Officer
Docket No. H-122
Room N-2625
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

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We are committed to working in a constructive and cooperative manner with OSHA in this proceeding. We believe that if OSHA is presented with relevant data, if it views the data completely and fairly, and if it takes the opportunity to observe the various working environments to which its regulatory decisions will apply, the Agency will be in the best possible position to make a decision which protects worker health and safety without placing unwarranted burdens upon American businesses and without unnecessarily intruding on the rights of workers.

Philip Morris Companies Inc. is the largest consumer packaged goods company in the world, with major tobacco, food and beer operations. The Company's operating subsidiaries include Philip Morris Incorporated (U.S.A.), the largest cigarette company in the United States; Philip Morris International, the leading United States exporter of cigarettes; Kraft General Foods, the largest food company in the U.S. and the second largest in the world; and Miller Brewing Company, the second largest brewing company in the world. These companies produce brand name products such as *Maxwell House, Sanka, Jell-O, Post, Kool-Aid, Marlboro, Entenmann's, Kraft* cheeses, *Parkay* margarine, *Oscar Mayer, Louis Rich, Breyers, Birds Eye, Cool Whip, Miller High Life* beer, and *Lite* beer. The Company's interests in this matter are (1) as an employer of approximately 166,000 employees of whom approximately 100,000 work in the United States, (2) as the owner and/or manager of over 1,000 buildings, and (3) as the largest manufacturer and exporter of cigarettes in the United States.

We recognize the complexity of the issues relating to OSHA's comprehensive consideration of indoor air quality as reflected in its Request for Information. We also recognize the concerns of some individuals and organizations regarding the issue of environmental tobacco smoke (or, as it is referred to in the Request for Information and will be referenced in the remainder of this submission, passive tobacco smoke [PTS]). We are aware that some people may find smoking objectionable in the work environment. We acknowledge the rights of all employees, and encourage the accommodation of both smokers and non-smokers through tolerance, common sense, and courtesy.

As the Agency undertakes its review of the volumes of data which have already, and will be, submitted in response to its Request for Information, we urge it to do so in a fair and impartial manner, and not to allow issues of personal preference or bias to affect its scientific and technical judgment. We urge the Agency to make decisions that are well-supported by a fair interpretation of the relevant data.

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We again thank you for the opportunity to provide our comments on this issue and offer to assist the Agency further in its deliberations. We look forward to the process.

Sincerely,

CONSTANGY, BROOKS & SMITH

By:_____

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2400 Peachtree Center Building
230 Peachtree Street, N.W.
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EXECUTIVE SUMMARY[1]

I. INTRODUCTION

On September 20, 1991, the Occupational Safety and Health Administration (OSHA) published a Request for Information (RFI) concerning "Occupational Exposure to Indoor Air Pollutants" in the Federal Register. 56 Fed. Reg. 47892 et seq. (1991). The stated purpose of this RFI is to gather data so that OSHA could determine "whether regulatory action is appropriate and feasible to control health problems related to poor indoor air quality." 56 Fed. Reg. 47892 (1991). In examining this central issue, OSHA has requested information concerning the health effects of poor indoor air quality, ventilation system performance, and "specific indoor contaminants such as passive tobacco smoke (PTS), radon and bioaerosols" and "their relative contribution to the overall degradation of indoor air quality as well as associated health effects and methods of exposure assessment and mitigation." 56 Fed. Reg. 47892 (1991).

Despite the Agency's stated central objective of examining all aspects of indoor air quality in determining whether

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1. This portion of the Philip Morris submission to Docket No. H-122 is intended only to summarize some of the critical points more fully discussed in its specific responses to the individual Request for Information inquiries. References within this Executive Summary are to the full text of the Company's responses to those individual questions.

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regulatory activity is warranted, we anticipate that a number of individuals and organizations will use the comment mechanism solely as a forum to vent their objections to passive tobacco smoke. This limited focus ignores significant contributors to indoor air quality problems and, in effect, argues that a ban on PTS will "solve the indoor air quality issue." As will be outlined in this summary and addressed fully in the appended substantive responses to the RFI inquiries, the relevant studies that have examined the role played by PTS on indoor air quality in the workplace environment have demonstrated that this role is minimal.

II. THE ROLE OF PASSIVE TOBACCO SMOKE IN INDOOR AIR QUALITY

A. Distinguishing PTS from Other Types of Tobacco Smoke

Before reviewing the scientific literature on "sick building syndrome" and the epidemiologic studies on health effects claimed to be associated with various substances (including PTS) found in many workplace indoor air environments, it is important that a clear understanding exist about the differences among (1) passive tobacco smoke (PTS) (often referred to in the literature as "environmental tobacco smoke" or "ETS"), (2) sidestream smoke (SS), and (3) mainstream smoke (MS). As discussed below, PTS is different in both quality and quantity from MS and SS.

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PTS is an aged and dilute mixture of sidestream smoke (the smoke from the burning end of a cigarette) and exhaled mainstream smoke (the smoke to which the smoker is exposed). PTS, a dynamic, ever-changing mixture which dissipates and undergoes chemical reactions and physical change as it ages, differs both chemically and physically from MS and SS. There is no single definable, reproducibly characterizable entity known as PTS.[2]

Studies indicate that PTS constituents are hundreds to thousands of times more dilute than either SS or MS. As a result, concentrations of PTS constituents often fall below detection limits of current scientific measurement techniques. (See Responses to Questions 2a(iii) and 35.) In addition, as PTS ages, a number of physical and chemical changes take place. As they age, matter evaporates from PTS particles, the particles also coagulate and increase in size, and chemical compounds transfer between the gas and particle phase of the smoke. Decay patterns for constituents of PTS vary over time and are dependent upon physical conditions in the environment.

PTS is not equivalent to either SS or MS. Yet, many studies employ sidestream/mainstream smoke comparisons, ostensibly to demonstrate the kind and quantity of constituents involved in

2. Baker, R. and Proctor, C., "The Origins and Properties of Environmental Tobacco Smoke," Environ. Intl. (16): 231-245, 1990.

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Informal Ventilation - Comment

exposure to PTS. These comparisons are misleading. (See Response to Question 2a(iii).) As was conceded in the 1986 National Academy of Sciences/National Research Council Report on PTS:

> Because the physicochemical nature of ETS, MS, and SS differ, the extrapolation of health effects from studies of MS or of active smokers to nonsmokers exposed to ETS may not be appropriate.[3]

B. PTS and Sick Building Syndrome

"Sick building syndrome" is generally characterized by a number of non-specific complaints which building occupants relate to conditions (usually the air quality) in the building. These complaints include headaches, nausea, coughs, sore eyes and breathing difficulties. Given the visibility of PTS, it is often initially identified as the cause of these complaints and symptoms. Its presence, however, is frequently an indication of poor ventilation, which results in the accumulation of many other indoor air components that may actually be associated with adverse effects. A review of a large number of actual "sick building" investigations reveals that PTS is correlated with complaints in only two to five percent of all sick buildings investigated.

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3. Committee on Passive Smoking, Board of Environmental Studies and Toxicology, National Research Council, National Academy of Sciences, Environmental Tobacco Smoke, Measuring Exposures and Assessing Health Effects, National Academy Press, Washington, D.C.: 7-8, 1986.

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Specifically, analysis of three large databases on sick building syndrome investigations, including databases from Health and Welfare Canada, T.D. Sterling Ltd., and Healthy Buildings International, reveals no significant correlations between IAQ complaints and specific agents. These results are consistent with the sick building investigations conducted by the National Institute of Occupational Safety and Health (NIOSH). In a review of 203 air quality investigations of schools, health care facilities, and government and business offices, NIOSH concluded that tobacco smoke played a contributing role in only 4 (2%) of the building complaints investigated.[4]

In over 50 percent of the sick building cases contained in the above referenced databases, many symptoms and complaints presumably could have been abated by increasing ventilation rates to those comparable to the rates specified in ASHRAE 62-1989. NIOSH officials recently reported on an additional 326 building investigations conducted by the Agency through 1988. Again, consistent with the other public and private databases, NIOSH reported that over 50 percent of its investigations revealed inadequate ventilation as the source of complaints. (See Response to Question 3a.)

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4. Melius, J., et al., "Indoor Air Quality -- the NIOSH Experience," Ann. Am. Conf. Gov. Ind. Hyg., Vol. 10 : 3-7 (1984).

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C. The Scientific Literature on PTS[5]

In the "Background" section of the RFI, OSHA states that workplace exposure to passive tobacco smoke is a "particular concern in matters dealing with indoor air quality" and asserts that:

> A wide range of health effects caused by passive exposure to tobacco smoke has been reported by the Surgeon General, the National Research Council, the Environmental Protection Agency (EPA), and private researchers, as well as by persons reporting health effects due to exposure to passive smoke while at work. These effects range from acute annoyance and eye and respiratory tract irritation to the development of chronic pulmonary disease, cardiovascular disease, and lung cancer.
>
> 56 Fed. Reg. 47892 (1991).

Contrary to the above assertions about the purported health effects of exposure to PTS in the workplace, the available data from published epidemiologic studies are not sufficient to

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5. In an attached document, Philip Morris has responded specifically to the 1986 Surgeon General's report on The Health Consequences of Involuntary Smoking, the Environmental Protection Agency's Draft Risk Assessment, Health Effects of Passive Smoking : Assessment of Lung Cancer in Adults and Respiratory Disorders in Children, the National Institute for Occupational Safety and Health's Current Intelligence Bulletin, Environmental Tobacco Smoke in the Workplace: Lung Cancer and Other Health Effects and several published risk assessments on PTS.

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support the claim that PTS exposure in the workplace is associated with chronic disease in nonsmokers. A primary deficiency in these studies is the lack of reliable exposure data. Published epidemiologic studies which report an association between spousal or parental smoking and chronic disease (e.g., lung cancer, heart disease, etc.) in nonsmokers are not based on actual exposure assessments for PTS. Instead, these studies rely on subjective responses to questionnaires to assess "exposure" rather than on any quantifiable measurement. For example, questionnaire inquiries regarding "spousal smoking," "parental smoking," or "living with a smoker" are used as surrogate determinants for PTS exposure in these studies. Numerous recent studies indicate, however, that such subjective assessments are an extremely unreliable and inaccurate measure of exposure. Furthermore, these questionnaire responses about exposure often vary widely when compared with actual measurements of PTS constituents in the ambient air. (See Response to Question 2a(iii).)

Actual data on nonsmoker exposure to PTS are available in other published literature. These studies, which measure PTS constituent levels, indicate that nonsmoker exposure to PTS under realistic conditions in public places and workplaces is minimal. For example, researchers report little difference in the ambient levels of carbon monoxide or volatile organic compounds in smoking and nonsmoking areas of workplaces and public places, or in homes

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with and without smokers.[6] In other studies, typical measurements of nicotine range from an exposure equivalent of 1/100 to less than 1/1,000 of one filter cigarette per hour.[7] (See Response to

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6. Kirk, P., et al., "Environmental Tobacco Smoke in Indoor Air." In: Indoor and Ambient Air Quality. R. Perry and P. Kirk (eds.). London, Selper Ltd., 99-112, 1988.

   Duncan, D. and Greavey, P., "Passive Smoking and Uptake of Carbon Monoxide in Flight Attendants," JAMA 251(20): 120-21, 1984.

   Cox, B. and Whichelow, M., "Carbon Monoxide Levels in the Breath of Smokers and Nonsmokers: Effect of Domestic Heating Systems," J Epidemiol Community Health 39: 75-78, 1985.

   Girman, J. and Traynor, G., "Indoor Concentrations," JAPCA 33(2): 89, 1983.

   Yocom, J., "Indoor Concentrations," JAPCA 33(2): 89, 1983.

   Nitta, H., et al., "Measurements of Indoor Carbon Monoxide Levels Using Passive Samplers in Korea." In: Indoor Air '90. The Fifth International Conference on Indoor Air Quality and Climate, Toronto, Canada, July 29-August 3, 77-82, 1990.

   Bayer, C. and Black, M., "Thermal Desorption/Gas Chromatographic/Mass Spectrometric Analysis of Volatile Organic Compounds in the Offices of Smokers and Nonsmokers," Biomed and Envir Mass Spect 14(8): 363-367, 1987.

   Proctor, C., et al., "Measurements of Environmental Tobacco Smoke in an Air-Conditioned Office Building," Environ Technol Letters (10): 1003-1018, 1989.

   Godish, T., "Formaldehyde Exposures from Tobacco Smoke: A Review," AJPH 79(8): 1044-1045, 1989.

   Godish, T., "Residential Formaldehyde: Increased Exposure Levels Aggravate Adverse Health Effects," Journal of Environmental Health 53(3): 34-35, 1990.

7. Hinds, W. and First, M., "Concentrations of Nicotine and Tobacco Smoke in Public Places," New England Journal of Medicine 292(16): 844-845, 1975.

(continued...)

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Questions 2a(iii), 24 and 35.) This means that a nonsmoker would have to spend from 100 to 1,000 hours or more in a workplace where smoking was permitted in order to be exposed to the nicotine equivalent of smoking a single cigarette.

D. Health Effects Purportedly Associated with PTS

It is asserted in the Request for Information that the health effects purportedly associated with PTS range from "acute

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7.(...continued)

Badre, R., et al., "Pollution Atmospherique par la Fumee de Tabac (Atmospheric Pollution by Smoking)," Ann Pharm Fr 36(9-10): 443-452, 1978. Translation.

Jenkins, R., et al., "Development and Application of a Thermal Desorption-Based Method for the Determination of Nicotine in Indoor Environments." In: Indoor and Ambient Air Quality. R. Perry and P. Kirk (eds.). London, Selper Ltd., 557-566, 1988.

Muramatsu, M., et al., "Estimation of Personal Exposure to Tobacco Smoke with a Newly Developed Nicotine Personal Monitor," Environ Res 35: 218-227, 1984.

Muramatsu, M., et al., "Estimation of Personal Exposure to Ambient Nicotine in Daily Environment," Arch Occup Environ Health 59: 545-550, 1987.

Thompson, C., et al., "A Thermal Desorption Method for the Determination of Nicotine in Indoor Environments," Envir Sci Tech 23: 429-435, 1989.

Foliart, D., et al., "Passive Absorption of Nicotine in Airline Flight Attendants," New England Journal of Medicine 308(18): 1105, 1983.

Oldaker, G. and Conrad, F., "Estimation of the Effect of Environmental Tobacco Smoke on Air Quality Within Passenger Cabins of Commercial Aircraft," Envir Sci Tech 21: 994-999, 1987.

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annoyance and eye irritation to the development of chronic pulmonary disease, cardiovascular disease and lung disease." We contend that the published research does not support this assertion.

1. Lung Cancer

The argument that PTS exposure increases the risk of lung cancer in nonsmokers is based on data from epidemiologic studies of nonsmoking women married to smokers (spousal smoking). Of the 30 published epidemiologic studies on the issue of spousal smoking and lung cancer, none actually measured exposure to PTS. Twenty-four of the 30 studies report results which are not statistically significant -- that is, their conclusions were consistent with the null hypothesis of no association between reported exposure to PTS and lung cancer in nonsmokers.[8] Only 12 of the published

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8. Despite the inconclusive nature of the epidemiologic data on spousal smoking, several risk assessments estimating excess lung cancer mortality purportedly due to PTS have appeared recently in the published literature. Two approaches have been used. The first attempts to extrapolate risks for the general nonsmoking population based upon the risk rates reported in epidemiologic studies on spousal smoking. One such risk assessment has estimated that as many as 5,000 deaths per year can be attributed to PTS exposure among nonsmokers in the U.S. The second approach estimates a risk for nonsmokers which is based upon the reported dose of tobacco smoke for active smokers.

Risk assessment models which are based upon dose-extrapolation from the active smoker disregard the physico-chemical differences between mainstream smoke and PTS. This approach also assumes the applicability of linear extrapolation from active smoking to very low estimates of PTS exposure and dose

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spousal studies have assessed reported workplace exposures to PTS at all, but again no actual measurements were conducted. Ten of the 12 workplace studies report associations between PTS and nonsmoker lung cancer which do not achieve statistical significance. Only two studies report marginally statistically significant increased risks for persons who reported exposure to PTS in the workplace. (See Response to Question 2a(iii).)

2. Heart Disease

There are no studies in the published literature which have examined actual PTS exposures in the workplace and heart disease in nonsmokers. Only twelve epidemiologic studies on spousal smoking in the home and heart disease in nonsmokers are available. These studies, based on marriage to a smoker, are not relevant to

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8.(...continued)
for nonsmokers. Dose-extrapolation models which employ unrealistically high estimates of PTS exposure for nonsmokers nevertheless generate mortality projections which are at least an order of magnitude lower than estimates from the epidemiologic-based models. Dose-extrapolation models which are based upon realistic exposure levels of PTS for nonsmokers from actual constituent monitoring studies in homes, public places and the workplace have failed to predict any significant increased risk for nonsmokers.

Both approaches have been criticized extensively in the published literature. In particular, both assessments assume a causal connection between PTS exposure and lung cancer in nonsmokers. Moreover, the risk assessment models which are based upon epidemiologic studies accept uncritically the relative risks reported in studies on spousal smoking. The approach also assumes, without foundation, that these reported risks are attributable solely to PTS.

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the workplace issue. In addition, the spousal smoking studies on heart disease contain no data on actual exposures to PTS. Instead, exposure estimates are derived from questionnaire responses.

Nonetheless, five of the 12 published epidemiologic studies on spousal smoking and heart disease did attempt to address workplace exposures to PTS. However, none of the five studies reported a statistically significant increased risk of heart disease among nonsmokers claiming exposure to PTS in the workplace. Thus, the existing literature does not provide support for the claim that PTS exposure in the workplace is related to an increase in risk of heart disease among nonsmokers.

3. Respiratory Disease Other than Cancer/Asthma

Relatively few studies have examined the possible relationship between reported exposure to PTS in the workplace and the respiratory health of nonsmoking adults. The studies that have been conducted on this issue reported contradictory results. Researchers who have reviewed these studies cited problems with the methodology utilized and pointed out that confounding factors are not adequately controlled for in the studies. (See Response to Question 2a(iii).)

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Data on the possible association between exposure and increased risk of an asthmatic reaction are similarly contradictory. There are nine major studies on the possible association between exposure to PTS and acute respiratory symptoms in adult asthmatics. The studies are inconsistent in their reported results which range from reported decreases in pulmonary function of several asthmatics exposed to PTS to conclusions that PTS exposures present no acute respiratory risks to asthmatics. The studies that do report an association between adult asthma and exposure to PTS suffer from several methodological flaws that include: (1) confounding factors that are not adequately controlled for in many studies; (2) inadequate sample sizes; (3) psychological factors that have not been ruled out; and, (4) reliance on unrealistic exposure conditions in enclosed smog chambers. (See Response to Question 2a(iii).)

III. SOURCES OF INDOOR AIR POLLUTION

PTS receives significant public attention because of its visibility in the indoor environment. However, as discussed above, the role of PTS in the make-up of the overall indoor air quality environment is minimal. In fact, in the RFI itself, OSHA has recognized that a myriad of specific airborne substances in indoor workplaces, often interacting with one another, result in health complaints related to indoor air quality. In many cases, investigations of these complaints have revealed exposure levels

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of the various constituents in indoor air well below established OSHA permissible exposure limits. Perhaps most notably, statistics cited in the RFI from approximately 500 NIOSH Health Hazard Evaluations reveal that while indoor air quality complaints result from numerous airborne substances, the source of most complaints is "inadequate ventilation." The primary types of indoor air quality problems encountered in these investigations were categorized as:

> inadequate ventilation (52%); contamination from inside the building (17%); contamination from outside the building (11%); microbiological contamination (5%); contamination from building materials and furnishings (3%) and unknown sources (12%).
>
> 56 Fed. Reg. 47892 (1991).

In its more detailed study of 203 of these investigations (1984), NIOSH reported that tobacco smoke was a contributing factor in only four (2%) of the buildings investigated. In a 1989 follow-up report of over 500 building investigations, NIOSH did not elect to even designate PTS as a separate category of contributing factors.[9]

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9. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, Division of Standards Development and Technology Transfer, "The NIOSH Approach to Conducting Indoor Air Quality Investigations in Office Buildings," Indoor Air Quality Selected References, September, 1989.

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A. Chemical Agents

There is a large body of scientific literature which suggests that exposure to significant levels of chemical agents in the indoor air environment, such as formaldehyde, carbon monoxide, nitrogen dioxide and carbon dioxide, is associated with complaints about adverse health effects. Organic chemical agents, including volatile organic compounds (VOCs), have specifically been implicated as contributors to indoor air complaints. For example, exposure to formaldehyde, which offgasses from some building products, has been associated with irritation of the eyes, skin, and the respiratory tract and has been designated a potential carcinogen in humans. The literature further suggests that exposure to other VOCs has similarly been associated with symptoms of sick building syndrome, such as headaches, dizziness, fatigue, eye, nose and throat irritation, and possibly decreased immunity. Scientists have also reported that there are synergistic reactions that possibly occur between significant levels of different chemical agents in the indoor environment, and that attempts to control individual sources of chemical agents may not be sufficient to prevent this potential combined effect. Moreover, specific VOC levels have been associated with specific health complaints from occupants of buildings with inadequate ventilation. (See Response to Questions 2a(i) and 26a.)

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B. Bioaerosols

In 1984, the New York Academy of Medicine drafted a resolution on indoor air pollution in which they stated:

> By far the most important substances in indoor air that affect human health are infectious agents, primarily viruses and bacteria, in the form of aerosols or as a part of droplets or particles. These cause more than 60,000 deaths and 250 million disabling illnesses in the United States each year. Their effects upon health are many times greater than that of all other indoor air pollutants.[10]

Bioaerosols are biological agents such as viruses, bacteria, mold spores, and fungi. In the indoor environment, the typical health effects associated with bioaerosols are infectious respiratory diseases such as Legionnaires' disease, Pontiac Fever, colds and influenza, and other conditions including hypersensitivity pneumonitis, humidifier fever, asthma, and sick building syndrome. The incidence of many of these illnesses has been linked to improper maintenance of ventilation systems or to inadequate levels of air exchange. For instance, Legionella pneumophila, the organism responsible for Legionnaires' disease, a form of severe, sometimes

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10. Committee on Public Health, New York Academy of Medicine, "Resolution Concerning Federal Legislation and Research on Indoor Air Pollution," Bulletin of the New York Academy of Medicine, 60 : 106-109, 1984.

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fatal pneumonia, has been isolated in water from ventilation systems. Publicly available statistics indicate that a substantial portion (as much as 40%) of buildings may have biological contamination. (See Response to Questions 2a(ii), 5b and 33a.)

C. Radon

Radon is a naturally occurring radioactive gas that is present in both outdoor and indoor environments. Radon is produced by the radioactive decay (breakdown) of uranium. Radon itself decays and produces "progeny" or "daughters," which along with the actual radon, can be inhaled. Epidemiologic studies report an increased risk of lung cancer associated with the inhalation of radon and radon progeny in underground miners. Based on extrapolation from the miner studies, it has been suggested that radon exposure may be responsible for 10-20% of the attributable lifetime lung cancer risk in the general population. Therefore, radon is a major mitigation concern for building owners. (See Response to Question 2a(iv).)

IV. EFFECTIVE VENTILATION AND INDOOR AIR QUALITY

One of the responses to the energy crisis of the 1970s was to reduce the volume of outside air introduced into buildings through their ventilation systems. Although this measure served a

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useful energy conservation purpose, it had the unintended consequence of increasing the incidence of health-related complaints associated with indoor air quality. As specifically noted in the "Background" section of the RFI, OSHA itself has recognized that "[h]ealth complaints related to indoor air quality . . . increased significantly following energy conservation measures instituted in the early seventies. Such measures have generally reduced the infiltration of outside air, allowing the build-up of indoor air contaminants." As discussed above, OSHA has further recognized that of the approximately 500 Health Hazard Evaluations for indoor air quality conducted by NIOSH over the past decade, 52% of the problems encountered were categorized as being due to inadequate ventilation. 56 Fed. Reg. 47892 (1991).

If OSHA determines that regulation of indoor air quality is warranted, the health complaints related to poor indoor air quality may be significantly reduced in a cost effective manner by adopting ventilation rates such as those specified in the American Society of Heating, Refrigerating and Air Conditioning Engineers[11] (ASHRAE) Standard 62-1989, "Ventilation for Acceptable Indoor Air Quality." ASHRAE Standard 62-1989 establishes minimum ventilation rates for various indoor settings in order to "control carbon dioxide and other contaminants with an adequate margin of safety,

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11. ASHRAE is a standard setting group that develops voluntary consensus guidelines for building designers and contractors.

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and to account for variations among people, varied activity levels, and a moderate amount of smoking." This Standard was approved in 1990 by the American National Standards Institute (ANSI). ASHRAE 62-1989 has been adopted by 12 states and by two major building code organizations in the United States, and is currently under consideration for adoption by the remaining national building code organizations. The Standard establishes a ventilation rate of 20 cubic feet of outside air per minute (cfm) per person for most commercial or office facilities, with 15 cfm as the minimum. The drafters of the Standard concluded that a minimum ventilation rate of 15 cfm/occupant will produce air quality that is acceptable to 70% of visitors and to 90% of occupants, assuming a moderate amount of smoking (30% smoking, 1.7 cigarettes/hour/smoker). See ASHRAE Standard 62-1989, "Ventilation for Acceptable Indoor Air Quality," Atlanta, ASHRAE Publications, 1989. Moreover, adoption of the ventilation rates in the current ASHRAE Standard would be consistent with OMB Policy Directive A-119 which instructs government agencies to look to consensus standards when establishing regulations.

The importance of adequate ventilation for achieving and maintaining acceptable indoor air quality should not be underestimated. Ventilation provides a comprehensive solution to

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problems with indoor air quality. As building investigators from Healthy Buildings International have noted:[12]

> Smoke accumulation within offices may be only the tip of the iceberg. If smoke is trapped by bad ventilation so are all other indoor pollutants. Many of these invisible chemicals, dusts, fibers, bacteria and fungi can have acute or long term health effects on the building occupants . . . [R]eacting solely to the visible evidence of poor ventilation omits invisible pollutants and certainly does not address the fundamental problem of inadequate ventilation.

Scientific and technical literature suggests that compliance with ventilation rates specified in ASHRAE Standard 62-1989 will effectively minimize complaints about PTS and other substances in indoor air. For example, in 1990, researchers presented results of their work comparing the effects of increased ventilation recommended by ASHRAE 62-1989 in areas where smoking is permitted and in areas where it is prohibited. Through the aid of computer models, the researchers demonstrated that the quality of air in areas where smoking is permitted does not differ significantly from the quality of air in non-smoking areas, where

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12. "Factors Affecting Employee Health & Comfort: Tobacco Smoke Signals New Challenges for Managers," Healthy Buildings International, September/October, 1991: 2-5.

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both areas are supplied with outside air at the level recommended by ASHRAE 62-1989.[13]

Scientific literature also reveals that increasing the rate of ventilation reduces levels of radon in indoor air. In their study of the reduction of indoor air concentrations of radon, Jonassen and McLaughlin wrote that:

> [T]he most effective way of reducing the activity concentrations of radon and its progeny in the room air is ventilation. Ventilation with radon free (or radon poor) air will, of course, reduce the concentrations of the daughter products directly by dilution.[14]

Not only will compliance with ventilation rates such as those in ASHRAE Standard 62-1989 help to achieve and maintain acceptable air quality in the workplace, but this goal can be accomplished cost effectively. Indeed, if state-of-the-art technology is employed in the design and operation of HVAC systems, ventilation rates at or above those specified by ASHRAE 62-1989 may be provided at reduced operating and energy costs, compared to

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13. Pedelty, J. and Holcomb, L., "A Computer Simulation of Indoor Air Quality Which Models Changes in Point Sources and Ventilation," Environ Technol Letters 11: 1053-1062, 1990.

14. Jonassen, N. and McLaughlin, J.P., "The Reduction of Indoor Air Concentrations of Radon Daughters Without the Use of Ventilation," The Science of the Total Environment 45: 485-492, 1985.

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the operation of traditional systems.[15] However, even in those instances where existing HVAC equipment is operated to deliver ventilation rates in accordance with all specifications in ASHRAE 62-1989, estimates of increased operating costs typically range from only 1% to 8%. Research suggests that even these costs would be offset by the benefits of improved productivity and reduced absenteeism that result from adequate ventilation.[16] In fact, some researchers have argued that the cost of absenteeism attributable to poor indoor air quality greatly exceeds any increased energy expenditures related to compliance with ASHRAE Standard 62-1989.[17] (See Responses to Questions 45, 48, 49, 66, 71, 75a and 85a.)[18]

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15. Electric Power Research Institute, Cold Air Distribution Design Guide, EPRI EM-5730 Project 2732-3, Final Report, March 1988.

16. Goodfellow, H. and J. Wyatt, "Critical Review of Ventilation Contaminants in indoor Air," Indoor Air Quality and Ventilation, ed. F. Lunau, London, Selper Ltd.: 95-104, 1990.

17. The Sheet Metal and Air Conditioning Contractor's National Association, Statement on H1066 "The Indoor Air Quality Act of 1991" to The House Science, Space and Technology Committee, Environment Subcommittee, May 9, 1991; Miller, R., Indoor Air Quality, (Norcross, GA., S.E.A.I. Technical Publications, 1991), 145; Binnie, P., "The Role of Ventilation in Controlling the Quality of Indoor Air, Including ETS," Other People's Tobacco Smoke, ed. A. Armitage, (East Yorkshire (U.K.), Galen Press 1991): 159-172.

18. See Philip Morris' response to RFI Question No. 92 which outlines the elements recommended for regulatory action on indoor air quality, should OSHA determine to promulgate an IAQ standard.

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V. CONCLUSION

We believe the scientific data demonstrate that typical exposures to PTS in the workplace are minimal (See Responses to Questions 24, 35-38), that PTS plays a minor role in "sick-building syndrome" (See Response to Question 3) and that ventilation rates such as those prescribed in ASHRAE Standard 62-1989 result in the maintenance of acceptable indoor air quality in general, including the dilution and removal of PTS and other indoor air constituents (See Responses to Questions 49, 62, 66, 71). There is a significant body of scientific literature which suggests that exposure to chemical agents, radon and bioaerosols in the indoor environment is associated with complaints and possible adverse health effects. Taken together, these data suggest that a focus on PTS in an attempt to address poor indoor air quality would be misdirected and inadequate. In fact, prohibition of smoking would not have affected indoor air quality problems in 95-98% of the building investigations reported to date.

The available data from published epidemiologic studies are not sufficient to support the claim that PTS exposure is associated with chronic disease in nonsmokers. Moreover, virtually all of the published epidemiologic studies that have attempted to address workplace exposure to PTS failed to report a significant

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increased risk of chronic disease in nonsmokers associated with PTS exposure in the workplace.

Thus, to the extent that OSHA determines that a need exists for regulatory action, it is recommended that OSHA frame its regulations in terms of an overall performance standard which will address inadequate ventilation, rather than through efforts to control each specific substance that may be found in indoor air. To this end, the ventilation rates set forth in ASHRAE Standard 62-1989 stand as the most commonly recognized ventilation standard designed to address complaints about indoor air quality. Consideration of this Standard by OSHA is consistent with OMB Policy Directive A-119 which instructs federal regulatory agencies to consider existing consensus standards and guidelines in addressing regulatory issues. Thus, if OSHA determines regulatory action is warranted, adoption of ventilation rates at least equivalent to those set forth in a general consensus standard like ASHRAE 62-1989 would constitute a well-reasoned approach that has been scientifically shown to improve indoor air quality and, at the same time, would allow employers flexibility in accommodating the wishes of their diverse workforces.

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PHILIP MORRIS COMMENTS ON THE 1986 SURGEON GENERAL'S REPORT, THE EPA DRAFT RISK ASSESSMENT, THE NIOSH CURRENT INTELLIGENCE BULLETIN, AND OTHER RISK ASSESSMENTS ON PTS

The conclusions of reports by three governmental agencies have been extensively relied upon by various organizations and individuals in discussions of health effects purportedly associated with environmental or "passive" tobacco smoke (PTS) exposure in the workplace. These reports are:

[1] The Health Consequences of Involuntary Smoking,[1] a 1986 report of the Surgeon General (hereinafter 1986 Surgeon General's Report);

[2] Health Effects of Passive Smoking: Assessment of Lung Cancer in Adults and Respiratory Disorders in Children (EPA/600/6-90/006A),[2] a review draft released by the Environmental Protection Agency (EPA) in 1990 (Draft Risk Assessment); and

[3] Environmental Tobacco Smoke in the Workplace: Lung Cancer and Other Health Effects,[3] a Current Intelligence Bulletin issued by the National Institute for Occupational Safety and Health in 1991 (NIOSH CIB).

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These reports have taken on importance in the context of this RFI to the extent that OSHA RFI commenters may try to rely upon these documents (and other published risk assessments, also discussed herein) in urging OSHA to regulate smoking in the workplace. As underscored in the following comments, these review papers do not provide a basis for regulation of smoking in the workplace by OSHA.

1986 Surgeon General's Report

The EPA draft risk assessment and the NIOSH CIB rely extensively on the conclusions of the 1986 Surgeon General's Report on "Involuntary Smoking," the U.S. Public Health Service's eighteenth report, and the fifth report issued during the tenure of C. Everett Koop. The 1986 Surgeon General's Report reached two major conclusions which some may urge are relevant to the workplace smoking issue:

> Involuntary smoking is a cause of disease, including lung cancer, in healthy nonsmokers. (p. vii)
>
> The simple separation of smokers and nonsmokers within the same air space may reduce, but does not eliminate, the exposure of nonsmokers to environmental tobacco smoke. (p. vii)

The Surgeon General's review has been challenged by a number of critics. One reviewer, Ann Fettner, suggested that the

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Surgeon General's conclusions were based on "flimsy" evidence presented in an effort to "divert our attention" from important health concerns such as the "poisoning of the environment."[4] A U.S. Congressman, Walter B. Jones, in a letter published in the Congressional Record, wrote that "the conclusions in the Surgeon General's Report are not supported by the research in his own report."[5] The Surgeon General's conclusions regarding lung cancer, cardiovascular disease, adult respiratory disease, and separation of smokers and nonsmokers are relevant to OSHA's current considerations of the workplace environment and will be discussed below in some detail.

Lung Cancer

The Surgeon General's conclusion that a causal relationship exists between PTS exposure and lung cancer in nonsmokers was based on 13 epidemiologic studies of women whose husbands smoked. Of those studies, eleven reported risk estimates that were not statistically significant.[6] Moreover, scientific deficiencies in the epidemiologic studies on PTS and nonsmoker lung cancer have been identified by numerous individuals. A German specialist in biometrics and epidemiology, Karl Uberla, in his assessment of these studies, suggested that the data fail to meet the criteria which some regard as necessary to establish a causal relationship:[7]

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> The majority of criteria for a causal connection are not fulfilled. There is no consistency, there is a weak association, there is no specificity, the dose-effect relation can be viewed controversially, bias and confounding are not adequately excluded, there is no intervention study, significance is only present under special conditions and the biologic plausibility can be judged controversially.

An eminent American statistician, Nathan Mantel, has also observed:[8]

> [I]t is unlikely that any epidemiological study has been, or can be, conducted which could permit establishing that the risk of lung cancer has been raised by passive smoking. Whether or not the risk is raised remains to be taken as a matter of faith according to one's choice.

There are currently 30 spousal smoking studies, 24 of which report risk estimates that are not statistically significant.[9-38] Only six studies report statistically significant increased lung cancer risks for women whose husbands smoke. Thus, these studies taken as a group, or considered individually, do not convincingly support rejection of the null hypothesis of no association between PTS exposure and lung cancer in nonsmokers, and therefore are inadequate as a basis for regulatory action.

Moreover, the vast majority of the spousal smoking studies report risk estimates that are less than 2.0. These values are at the limit of detection for epidemiology. Risk estimates below 2.0

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or 3.0 have been described as "weak," and thus, any conclusions drawn from such studies are unreliable.[39] This is particularly true when the studies themselves fail to account for numerous sources of bias and confounding factors. The confounding factors are variables associated with both the classification of "marriage to a smoker" and with risk factors associated with lung cancer, the existence of which can give rise to a spurious PTS-lung cancer association. Examples of confounding factors that are not controlled for in the studies include diet, alcohol consumption, cooking and heating methods, occupation, physical activity, urbanization and socioeconomic class.[40]

In addition, application of spousal smoking studies to the workplace presents significant questions. Even the Surgeon General conceded that "[m]ore accurate estimates for the assessment of exposure in the home, workplace, and other environments are needed" (p. 101).

In fact, the epidemiologic studies on lung cancer and respiratory disease cited in the Surgeon General's Report did not include any actual measurements of study subjects' exposure to PTS in either the home or the workplace. Instead, the studies relied on questionnaire information to estimate exposure to PTS. The Surgeon General's Report itself acknowledges that the "possibility of reporting bias must be considered for the studies

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that have used questionnaires to measure illness experience" (p. 38). A number of researchers have reported that exposure misclassification can lead to improper indices of exposure and incorrect estimations of risk.[10,41-46] The Surgeon General's Report also concedes that "validated questionnaires are needed for the assessment of recent and remote exposure to environmental tobacco smoke in the home, workplace, and other environments" (p. 107). The National Research Council and other authors have recently criticized questionnaires used in PTS studies for not being standardized or validated, pointing out that misclassification of exposure may occur if the questionnaire is not appropriately designed.[47-49]

Separation of Smokers and Nonsmokers

The Surgeon General's Report also concluded that "simple separation of smokers and nonsmokers within the same air space may reduce, but does not eliminate, exposure of nonsmokers to environmental tobacco smoke" (p. vii). The Report concludes that smoking bans will not only reduce PTS exposures, but will also "alter smoking behavior and public attitudes about tobacco use" (p. 322). The Report further suggests that "over time, this may contribute to a reduction of smoking in the United States" (p. 322). Thus, the underlying motivation for the use of the PTS/health argument is to attain a "smoke-free society by the year 2000."

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The Surgeon General's claim that separation of smokers and nonsmokers does not minimize nonsmoker exposure to PTS is without scientific support. Studies aboard commercial aircraft and in offices indicate, contrary to the Surgeon General's Report, that the simple separation of smokers and nonsmokers effectively minimizes nonsmoker exposure to PTS.[50-57] One recent study, for example, reported that the use of designated smoking areas reduced exposure to PTS by 95 percent.[50] Another study of a smoking-restricted office building reported that ambient nicotine in nonsmoking areas was virtually undetectable, suggesting that PTS had a negligible impact on the nonsmoking areas in the building.[51] In addition, Canadian researchers Sterling, et al., in a series of studies, collected data on levels of PTS constituents in offices with different smoking policies. They reported no significant differences in average PTS constituent levels between nonsmoking offices that received recirculated air from designated smoking areas and nonsmoking offices that did not receive recirculated air.[52-53,57] They concluded:

> The results indicate that the provision of a designated, but not separately ventilated smoking area can effectively eliminate or drastically reduce most components of environmental tobacco smoke from nonsmoking offices.

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Adult Respiratory Disease

The Surgeon General's Report also addressed purported changes in pulmonary function in adults reportedly exposed to PTS. The Surgeon General concluded that

> healthy adults exposed to environmental tobacco smoke may have small changes on pulmonary function testing, but are unlikely to experience clinically significant deficits in pulmonary function as a result of exposure to environmental tobacco smoke alone. (p. 13)

Two major research groups have examined the possible association between exposure to PTS in the workplace and pulmonary function in adult nonsmokers. White and Froeb reported, based on their measurements of the small airways function of smokers and nonsmokers in the workplace, that nonsmokers exposed to tobacco smoke at work for 20 or more years had reduced function of the small airways compared to nonsmokers who did not have such exposures.[58]

The White and Froeb study has been criticized for numerous reasons, including its assessment of PTS exposure and its method of subject selection.[59-62] Furthermore, White and Froeb themselves noted that the average values of the pulmonary tests of nonsmokers exposed to tobacco smoke "were not notably different" from the values suggested as normal by a specialist in this area.[63] Dr.

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Michael Lebowitz of the University of Arizona wrote the following regarding the White and Froeb study:[64]

> Even with a biased population, poor study design, and incorrect statistical evaluation, there were no clear-cut, consistent, medically meaningful differences between passive smokers and groups of nonsmokers; a corrected statistical analysis strengthened this conclusion.

Moreover, the Surgeon General wrote:

> The [White and Froeb] study population was self-selected, and the exposure classification was crude and did not account for people who changed jobs. (p. 60)

In addition to these concerns, the results of White/Froeb appear to be inconsistent with those of a second research group, Kentner, et al., who reported no effect of PTS on pulmonary function measurements among 1,351 German office workers.[65] In a 1988 update of the study, Kentner and colleagues noted that[66]

> there is no evidence that average everyday passive smoke exposure in the office or at home leads to an essential reduction of lung function in healthy adults.

The key investigator for the study reported these same findings in 1989 and 1990 publications.[67,68]

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The Surgeon General's Report also addressed the issue of acute effects on the pulmonary function of adult nonsmokers exposed to PTS, the Surgeon General concluded that "the magnitude of these changes is quite small, even at moderate to high exposure levels, and it is unlikely that this change in airflow, per se, results in symptoms" (p. 63). The studies available on asthmatic adults are clinical studies that have potential applicability to the home and the workplace setting. However, the studies that have reported an association between exposure to PTS and reactions in asthmatics have several problems. Regarding the studies on asthma in adults, the Surgeon General wrote:

> Acute exposure in a chamber may not adequately represent exposure in the general environment. Biases in observation and the [sic] in selection of subjects and the subjects' own expectations may account for the widely divergent results. Studies of large numbers of individuals with measurement of the relevant physiologic and exposure parameters will be necessary to adequately address the effects of environmental tobacco smoke exposure on asthmatics. (p. 65)

Cardiovascular Disease

The Surgeon General's 1986 conclusion on cardiovascular disease and PTS was that further studies "are needed in order to determine whether involuntary smoking increases the risk of cardiovascular disease" (p. 14). In 1988, Fielding, et al., reviewers from the University of California-Los Angeles, who are

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critical of smoking, conceded that "no firm conclusion that a causal relation exists is yet warranted" for reported PTS exposures and cardiovascular disease.[69] A similar view was expressed in a 1988 review from a Harvard physician, who said that there were "no clear data" that PTS increases heart disease risk.[70]

Several additional evaluations of the literature on PTS and heart disease appeared in 1990. Two of these were reported at international conferences in Lisbon, Portugal[71] and in Budapest, Hungary.[72] Both argued strongly that the data on PTS and heart disease were methodologically weak and insufficient to draw conclusions. In another major review, this one from the United States, two physicians, Drs. Mahajan and Huber, concluded that "the data that are available are so sparse that any attempt to reach a definitive assessment would be fraught with uncertainty."[73] Perhaps the most recent review of the literature on PTS and heart disease was published in 1991 by A.K. Armitage, the former director of toxicology of a major European research laboratory.[74] He described the scientific data relating to a possible heart disease risk in nonsmokers exposed to PTS as "not very convincing."

In summary, the Surgeon General's claims that exposure to PTS increases the risk of lung cancer in nonsmokers and that simple separation of smokers and nonsmokers is ineffective in minimizing exposure are not convincingly supported by the scientific

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data and should not be used as a basis for workplace smoking policy decisions.

EPA Draft Risk Assessment

In June, 1990, the United States Environmental Protection Agency (EPA) released for review its Draft Risk Assessment on PTS.[2] The Draft Risk Assessment concluded that exposure to PTS is causally related to lung cancer in adult nonsmokers and is associated with respiratory disease and respiratory symptoms in children. The Draft Risk Assessment also concluded that PTS should be classified as a Group A ("known human") carcinogen. It estimated that PTS exposures are responsible for 3,800 lung cancer deaths per year in the U.S. (the estimate was later revised to 3,700).

The Draft Risk Assessment employed a Population-Attributable Risk model for estimating excess lung cancer mortality among nonsmokers reportedly exposed to PTS.[2] This model is based upon three estimates:

1. a point estimate or relative risk derived from a meta-analysis of epidemiologic studies on spousal smoking;
2. the proportion of nonsmokers reportedly exposed to PTS; and
3. the number of nonsmokers in the general population.

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To calculate the Population-Attributable Risk (PAR), the authors of the Draft Risk Assessment estimated that 60% of nonsmokers are exposed to PTS. A cumulative relative risk of 1.28 was calculated via meta-analysis from epidemiologic studies on spousal smoking as the excess risk due to PTS exposure. The PAR for these two assumptions is 0.27. The total number of deaths for nonsmoking males and females was then estimated, based on the American Cancer Society's projections for 1988 (9,500 total deaths). By multiplying the PAR (0.27) by 9,500, the authors generated an estimate of 2,560 total deaths per year attributable to PTS exposure among neversmokers. A PAR was also computed for male and female former smokers, generating a total estimate of 3,800 excess deaths annually purportedly attributable to PTS exposure among nonsmokers in the U.S.

The PAR method employs estimates of relative risk, population fractions of exposure to PTS and lung cancer death rates for the general nonsmoking population in order to generate an estimate of excess mortality reportedly attributable to PTS exposure. It is important to note at the outset that the PAR model itself does not determine that there is an increased risk of lung cancer among nonsmokers from PTS exposure. Rather, the model <u>assumes</u> a causal relationship between PTS exposure and an increased risk of lung cancer among nonsmokers, based upon increased risks

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reported in epidemiologic studies on spousal smoking. These reported relative risks are, in turn, assumed to represent true relative risks due to PTS exposure.

These critical assumptions have been challenged.[75] To achieve a cumulative excess risk estimate of 1.28 for nonsmokers reportedly exposed to PTS, the authors of the Draft Risk Assessment performed a meta-analysis of 23 epidemiologic studies on spousal smoking. However, eighteen of the studies on spousal smoking included in the EPA's meta-analysis fail to achieve statistical significance and are, therefore, consistent with the null hypothesis of no association between spousal smoking and an increased risk of lung cancer among nonsmokers. Moreover, the epidemiologic studies on spousal smoking contain no actual exposure data on PTS. The EPA Draft instead assumed the validity of questionnaire responses about possible exposure to PTS based upon spousal smoking and then generalized these responses to the general population's exposure to PTS. Finally, the authors of the Draft Risk Assessment failed to consider and adjust for confounding factors, e.g., diet, lifestyle, genetics, etc., in any of the individual studies on spousal smoking. This is a significant oversight, especially when dealing with a "weak" relative risk which approximates 1.3.

The Draft's assumption of causality is based upon tenuous data from epidemiologic studies on spousal smoking. The assumption

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is the critical element to the PAR model and the estimate of 3,800 excess nonsmoker deaths per year reportedly due to PTS exposure. The Draft Risk Assessment fails to argue convincingly for the assumption. Without the causal assumption, the PAR approach is little more than an exercise in mathematical modeling.

Furthermore, the conclusions of the Draft Risk Assessment have been strongly criticized, particularly in many of the more than 100 comments submitted during the public comment period on the draft.[75] Specifically, many of the public comments found EPA's classification of PTS as a Group A carcinogen to be scientifically unwarranted.

EPA's proposed classification of tobacco smoke as a "human carcinogen" was based in part upon the imputed identification and presence of suspected carcinogens in mainstream smoke and/or fresh sidestream smoke. However, the EPA apparently did not review the available published data on either the characterization of, or exposure to, PTS. PTS is neither chemically nor physically equivalent to either mainstream or sidestream smoke, and it is therefore not scientifically acceptable to treat PTS, mainstream smoke and sidestream smoke as qualitatively and quantitatively similar mixtures.[76-81] (See also Responses to Questions 2a(iii) and 35.)

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As discussed above, meta-analysis, a statistical procedure which combines the reported risk estimates from a number of studies to generate an overall estimate of risk, was used in the EPA's Population-Attributable Risk model. The problems and limitations of the use of meta-analysis for epidemiologic studies have been addressed in the scientific literature.[82,83] For instance, meta-analysis does not account for intrinsic bias and confounding in the individual studies. As two German scientists, Heinz Letzel and Karl Uberla, noted: "Combining risk estimates from biased or confounded studies by meta-analysis cannot provide correct answers."[83] The spousal smoking studies were conducted in the United States, Europe and Asia. These populations differ genetically and in lifestyle factors, and the studies themselves differ in design.[82]

Another major criticism of the Draft Risk Assessment was that in addition to its inadequate treatment of the data on the physical and chemical properties of PTS, it also virtually ignored the available exposure data, toxicological data and data from animal studies on PTS. For instance, not one of the spousal smoking studies included actual measurements of PTS exposure; exposure was only estimated by responses to questionnaires. However, a large body of literature exists on actual measurements of PTS in indoor environments, which was not considered in the Draft Risk Assessment.[52,76,84-87] While these data are independent of the epidemiologic

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literature, they suggest that nonsmoker exposure to PTS in typical public places and workplaces is minimal.[52,84-87] (See Response to Question 2a(iii).) For example, some studies report typical measurements of nicotine ranging from an exposure equivalent of 1/100 to less than 1/1,000 of one filter cigarette per hour.[56,88-94]

Thus, the conclusions of the EPA's Draft Risk Assessment are based on an incomplete and selective review of the existing data on PTS. Several of the public comments suggested that this amounted to EPA's apparent failure to follow its own guidelines for carcinogen risk assessment.[75]

NIOSH Current Intelligence Bulletin

In June 1991, NIOSH released Current Intelligence Bulletin 54 on environmental tobacco smoke.[3] The NIOSH CIB stated that:

> NIOSH has determined that the collective weight of evidence (i.e., that from the Surgeon General's reports, the similarities in composition of MS and ETS, and the recent epidemiologic studies) is sufficient to conclude that ETS poses an increased risk of lung cancer and possibly heart disease to occupationally exposed workers. (p. 12)

In the excerpt above, the CIB refers to three areas that contribute to its "collective weight of evidence." The Surgeon

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General's report is the first area; however, the conclusions of the Surgeon General's report have been extensively criticized, as discussed above. As for the second type of "evidence" (the claimed "similarities in composition of MS and ETS"), the treatment of the available data in the NIOSH CIB is neither detailed nor complete.

Although the NIOSH CIB and the EPA Draft Risk Assessment stress the reported association between active smoking and disease in reaching their conclusions about PTS, neither report provides detailed discussions of the chemical and physical natures and differences between PTS and mainstream smoke (MS). PTS is different in both quality and quantity from both mainstream and sidestream smoke. (See Responses to Questions 2a(iii) and 35.)

One major area overlooked by both the NIOSH CIB and the EPA Draft Risk Assessment is those scientific studies that actually measured levels of PTS constituents in indoor air. There is a substantial body of literature in this area which is directly relevant to considerations about non-industrial workplace exposure. If the actual data on PTS exposures in the workplace are examined, one finds that typical workplace exposures to PTS are minimal and often below limits of detection for even the most sensitive tobacco smoke constituent monitors. (See Response to Question 2a(iii).)

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The final aspect of NIOSH's "weight of the evidence" is "recent epidemiologic studies" on PTS and lung cancer. However, its review of the spousal smoking studies is incomplete. The CIB states that eight additional spousal smoking studies have been published since 1986, when, actually, 14 have been published, most of which report associations which do not achieve statistical significance. Furthermore, the CIB acknowledges serious shortcomings in the available epidemiologic studies purporting to relate PTS exposure and lung cancer:

> NIOSH recognizes that these recent epidemiologic studies have several shortcomings: lack of objective measures for characterizing and quantifying exposures, failure to adjust for all confounding variables, potential misclassification of ex-smokers as nonsmokers, unavailability of comparison groups that have not been exposed to ETS, and low statistical power.

Nevertheless, the CIB uses spousal smoking studies to reach its conclusion about occupational exposure to PTS without justifying the relevance of spousal smoking studies to workplace exposure. Of the spousal smoking studies, none actually measured levels of PTS to which the subjects ostensibly were exposed. The NIOSH CIB also fails to address the 12 spousal smoking studies that included specific questions about workplace exposure.[9-20] Of those studies, ten reported no statistically significant increased risk of lung cancer for nonsmokers who reported PTS exposure in

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the workplace. The other two studies presented risk estimates which were of borderline statistical significance. Thus, the epidemiologic data are consistent with the null hypothesis, i.e., that there is no association between workplace PTS exposure and nonsmoker lung cancer.

The CIB also purports to review the studies on PTS and heart disease that have appeared since 1986, at which time the Surgeon General remarked that more studies were needed before a conclusion of an association could be made. While additional studies have been published since 1986, taken as a whole, the studies still do not allow a conclusion to be reached.[95] Moreover, the epidemiologic studies on PTS and heart disease may be criticized for several reasons: they use spousal smoking as a surrogate for PTS exposure, they do not have clinical diagnoses of heart disease (e.g., they rely on death certificate data or self-reported symptoms), and they fail to adequately account for confounding factors. The latter include family history of heart disease, blood pressure, serum lipoprotein levels, body mass index, age, menopausal status, dietary fat, alcohol consumption, diabetes and lifestyle factors (e.g., a sedentary lifestyle).

Thus, the NIOSH CIB, which reaches conclusions about purported risks associated with exposure to PTS in the workplace, is not a comprehensive, critical review of the available data.

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Of even greater significance, it does not address available workplace data on exposures or potential health effects.

Other Risk Assessments on PTS

Two basic methods (modeling procedures) for estimating the population risk for lung cancer among nonsmokers reporting exposure to PTS have appeared in the scientific literature. The first method, adopted by the U.S. EPA in its Draft Risk Assessment (discussed above), is the Population-Attributable Risk (PAR) approach. A PAR model seeks to establish an estimate of excess risk due to PTS exposure and is expressed as a ratio of the risk assessed for PTS to the total lung cancer risk for nonsmokers from all sources. The PAR is calculated by applying a relative risk estimate associated with reported exposure to PTS (derived from risk rates in epidemiologic studies) to the percentage of individuals believed to be exposed to PTS in the general population.

A second approach used in the literature, called the Extrapolation Method (also called the Linear Extrapolation Method or Dose-Response Extrapolation Model), combines reported risks of lung cancer for active smokers, derived from epidemiologic studies on smokers, with estimates of tobacco smoke exposure (dose) for active smokers. The risk and dose estimates for active smokers are then extrapolated downward to apply to nonsmokers. The

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estimated excess risk for nonsmokers exposed to PTS is obtained by dividing the lung cancer risk reported for active smokers by the ratio between the smokers' and nonsmokers' estimated average exposure to tobacco smoke.

This second approach for estimating excess lung cancer deaths among nonsmokers reportedly due to ETS exposure is exemplified by the model developed by Repace and Lowrey (1985).[96] The authors employed a linear downward extrapolation from the lung cancer risk reported for active smokers (and estimates of tobacco smoke exposure for smokers) to an exposure and residual risk estimate for nonsmokers allegedly exposed to PTS. The model estimated lung cancer mortality among nonsmokers by dividing the reported lung cancer risk for active smokers by a ratio of estimated tobacco smoke exposure for smokers and nonsmokers. The linear dose-extrapolation model therefore requires four estimates:

1. the number of nonsmokers supposedly exposed to PTS;
2. the average PTS exposure of nonsmokers;
3. the average tobacco smoke exposure for active smokers; and
4. the lung cancer risks reported for current active smokers.

Specifically, Repace and Lowrey developed a version of a linear dose-response extrapolation model which is based upon a

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weighted average of nonsmoker exposure to particulates. The weighted average estimate was not derived from actual exposure data but from a model which predicts ambient concentrations of particulate matter from the number of cigarettes smoked in a given volume of air space. The authors also calculated a lung cancer risk estimate and an estimate of daily "tar" (particulate) intake for active smokers. Nonsmoker risk of lung cancer was extrapolated from those estimates to yield 555 lung cancer deaths per year attributable to PTS exposure among nonsmokers.

Arundel, et al., (1987) refined the Repace and Lowrey extrapolation model by replacing Repace and Lowrey's estimates of particulate matter exposure for nonsmokers with actual exposure data from monitoring studies.[97] The Arundel, et al., model also rejected Repace and Lowrey's extrapolation from the dose of active smokers to the exposure of nonsmokers, and replaces the latter with an estimated retained dose of particulates for nonsmokers. Using virtually the same assumptions as Repace and Lowrey, the Arundel et al. model estimates 12 lung cancer deaths per year among 40 million male and female neversmokers.

The various assumptions and estimates employed in the Repace and Lowrey linear dose-extrapolation model have been challenged by a number of scientists.[97-101] One scientist noted that the exposure and dose levels Repace and Lowrey used were not

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based on actual measurements, and that actual measurements reported by other researchers ranged from "ten-to-one-hundred-fold less than that in the Repace and Lowrey model."[98]

Still other scientists have questioned the methods of analysis used in their article.[99-101] For example, the Repace and Lowrey extrapolation model assumes that the carcinogenicity of tobacco smoke depends upon some (unknown) element purportedly located in the particulate phase of PTS. The model also assumes that lung cancer per unit of exposure (i.e., per mg of "tar") is the same for mainstream smoke and PTS, an assumption which is not borne out by the scientific data regarding the chemistry of mainstream smoke and PTS. Moreover, the extrapolation model suggests that the relationship between reported risk and level of exposure is linear (i.e., dose-response), and it assumes that there is no exposure level below which lung cancer risk is absent. The dose-extrapolation model also assumes, with its suggestion of a linear dose-response from active smoking to low level exposure to PTS, that the so-called "one-hit" cancer theory, a theory that one molecule of exposure to a suspected carcinogen is sufficient to induce carcinogenesis, is valid. However, the "one-hit" model has what statisticians call a "zero intercept term," which is equivalent to assuming that lung cancer risk among nonsmokers is zero <u>in the absence of ETS</u>.

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Even with its dubious assumptions and estimates, it is noteworthy that the linear dose-extrapolation model produces estimates of excess lung cancer deaths which are roughly an order of magnitude lower than estimates generated by the PAR model which relies on epidemiologic studies. A number of subsequently published extrapolation models, unlike that of Repace and Lowrey, have been based upon actual data and reasonable estimates of exposure.[97,102-104] These models have been unsuccessful in estimating any appreciable increased risk of lung cancer for nonsmokers reporting exposure to PTS. Indeed, extrapolation models based on estimates of retained particulate matter generate estimates of excess risk which are as much as 20 orders of magnitude lower than estimates generated by the PAR method. Such vast ranges underscore the difference between risk estimates based on epidemiology and those based on dosimetry. This difference is so striking that even the authors of the EPA Draft Risk Assessment were unable to generate a "dose-response based on the extrapolation from mainstream to environmental tobacco smoke," and hence, relied solely upon the PAR model to support their contention of an increased risk of lung cancer among nonsmokers reportedly exposed to PTS.[105]

There have been two published risk assessments of environmental tobacco smoke (ETS) exposure and heart disease, the first by A. Judson Wells in 1988,[106] and the second by Kyle Steenland in 1992.[107] However, despite his never having published

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a risk assessment on ETS and heart disease, Stanton Glantz is the individual most often cited for the conclusion that a large number of annual heart disease deaths in the U.S. are attributable to ETS exposure. In a 1991 article with William Parmley,[108] Glantz claimed that the number of annual ETS-related nonsmoker deaths in the U.S. is approximately 53,000, the largest portion of which (37,000) he claimed was from heart disease.

The figure of 53,000 annual U.S. deaths attributed to ETS exposure originated in a publication by A. Judson Wells in 1988,[106] although Wells actually argued for a "best estimate" of ETS related deaths that was somewhat lower, about 46,000, with 32,000 of these due to heart disease. Stanton Glantz and William Parmley repeated the 53,000 figure in their 1991 article in Circulation. However, they did not themselves independently perform a calculation of "excess" deaths, but instead relied on the earlier work by Wells, which is cited by Glantz and Parmley as the basis for their claim.

To calculate excess deaths due to ETS exposure, Wells used meta-analysis to derive ETS-associated relative risks for lung cancer, heart disease and cancers other than the lung. These relative risks, together with an estimate of the fraction of the population exposed to ETS, were entered into an equation that was used to calculate excess death rates for never smokers. To derive a value of actual numbers of deaths related to ETS exposure, these

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excess death rates were multiplied by the number of people in the U.S. estimated to be exposed. Based on such calculations, Wells estimated that ETS exposure produced 39,000 excess deaths per year in the U.S.

Further calculations attempted to take into account misclassification, either of smokers as nonsmokers or of nonexposed nonsmokers as exposed to ETS. Wells calculated that these adjustments for misclassification resulted in a revision upward of the estimate, from 39,000 to 53,000. Wells then stated that a more "conservative" estimate would be 46,000, a value chosen because it is halfway between the unadjusted value of 39,000 and the adjusted value of 53,000.

It is clear that the claim of 53,000 excess deaths associated with ETS exposure is assailable at every level of its derivation. At the most fundamental level, the studies contributing to the meta-analysis are scientifically flawed. The flaws stem from, among other reasons, small sample sizes, inadequate control for potential confounding factors and unreliable estimates of ETS exposure. Such flaws contribute to the invalidity of the subsequent meta-analysis, a technique which is further called into question because it is not designed to bring together such methodologically disparate studies. Furthermore, any overall estimate of the prevalence and levels of ETS exposure within the U.S. is based on

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assumptions, rather than direct measurement. In addition, a variety of other unproven assumptions are made in attempting to adjust the data to take potential misclassification into account. Finally, the seemingly capricious derivation of the annual death rate claim is reflected in Wells' final calculation in which he decided, based on no particular formula, that the value of 46,000 would be a "best estimate," simply because it was halfway between an unadjusted and adjusted estimate. Such loose and unscientific conclusions should not form a basis for regulatory action.

Kyle Steenland, a National Institute for Occupational Safety and Health employee, also performed a risk assessment of ETS and heart disease, published in 1992.[107] He calculated that 35,000-40,000 annual U.S. heart disease deaths are attributable to ETS exposure. He concluded that "heart disease mortality is contributing the bulk of the public health burden imposed by passive smoking."

There are two important differences between Steenland's estimation process and that used by Wells. First, Steenland did not do a meta-analysis to obtain a pooled estimate of relative risk for heart disease mortality associated with ETS exposure. Instead, he simply adopted the relative risk reported in a single study of a Maryland sample[109] and applied that to the entire U.S.

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population. Second, he focused only on heart disease and did not attempt to calculate ETS-related deaths from other diseases.

Other than the above, Steenland's procedure for calculating deaths attributable to ETS exposure was generally similar to that reported by Wells. This estimation process involved: positing an overall increase in relative risk of heart disease associated with ETS exposure; making adjustments for potential misclassification and for background exposure; estimating the extent of exposure to ETS; and estimating the fraction of nonsmoker heart disease deaths attributable to ETS exposure. These estimates were incorporated into a formula using data on U.S. heart disease death rates and population estimates, from which was derived an estimated number of annual heart disease deaths attributed to ETS exposure. According to Steenland's calculations, "the overall estimate of ETS-attributable heart disease deaths for never-smokers and former smokers is 35000 to 40000." He further commented that these increased risks of death "are higher than those accepted in regulating environmental toxins."

Steenland's calculations involved problems similar to those that plagued Wells' attempt to derive a number of deaths associated with ETS exposure. Although Steenland cannot be criticized for performing an invalid meta-analysis (because he did no meta-analysis at all), his procedure can perhaps be criticized

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even more severely because he took a relative risk based on a single study from a single county in a single state and applied it to the United States as a whole. Criticisms relating to unverified assumptions, which were noted in regard to Wells' calculations, also apply to Steenland's procedure.

Summary

The conclusions of these governmental reports and other publications are extensively relied upon by those who claim that there is a possible association between PTS exposure in the workplace and adverse health effects in nonsmokers. However, these reports and assertions have serious deficiencies that make their conclusions difficult to support. When appropriate scientific scrutiny is exercised, these reports and articles do not provide a defensible basis for the regulation of smoking in the workplace by OSHA.

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PHILIP MORRIS RESPONSE TO OSHA RFI

Question 92: "If OSHA determines, on the basis of adequate evidence, that regulatory action is needed to protect employees from adverse health effects related to indoor air quality, what elements do you believe such regulation should include? Please provide the basis for your suggested element(s)."

Response:

Our review of the scientific data indicates that nonsmoker exposure to PTS constituents in the workplace is minimal. Typical markers used for estimating PTS exposure include carbon monoxide and nicotine. Monitoring under typical, realistic conditions in public places, restaurants and workplaces indicates that carbon monoxide levels in indoor atmospheres are not significantly different in areas where smoking is allowed compared to areas where smoking is not permitted. Although smoking and nonsmoking areas can be distinguished by ambient nicotine levels, the reported nicotine levels in smoking areas are many times below the occupational exposure limits. Studies indicate that typical measurements of nicotine in indoor atmospheres where smoking is permitted range from an exposure equivalent of 1/100 to less than 1/1,000 of one filter cigarette per hour. This means that a nonsmoker would have to spend from 100 to 1,000 hours or more in an office, restaurant, or public place where smoking was permitted in

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order to be exposed to the nicotine equivalent of smoking a single cigarette.

PTS similarly plays a minor role in "sick building syndrome." A review of four large databases on sick building syndrome investigations, including NIOSH, Health and Welfare Canada, T.D. Sterling and Associates, Ltd., and Healthy Buildings International, reveals that PTS played a contributing role in less then 5% of all the building complaints investigated. Thus, a focus on PTS in an attempt to address poor indoor air quality would be both misdirected and inadequate. As the above databases suggest, a ban on workplace smoking would have had no effect on complaints regarding indoor air quality in over 95% of the sick buildings investigated to date.

Instead of attempting to regulate the complex issue of indoor air quality through efforts to examine and control every substance that may be found in the indoor environment, data indicate that acceptable indoor air quality can be achieved in most workplaces through adequate ventilation. Specifically, the ventilation rates prescribed in ASHRAE Standard 62-1989 are expressly designed to "control carbon dioxide and other contaminants with an adequate margin of safety, and to account for variations among people, varied activity levels, and a moderate amount of smoking."

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The effectiveness of ASHRAE Standard 62-1989 for dilution and removal of PTS constituents and other substances in indoor air, including bioaerosols and radon, has been evaluated by scientists. In 1990, researchers presented results of a study comparing the effects of increased ventilation recommended by ASHRAE 62-1989 in areas where smoking is permitted and in areas where it is prohibited.[1] Through the aid of computer models, the researchers demonstrated that the quality of air in areas where smoking is permitted does not differ significantly from the quality of air in nonsmoking areas, where both areas are supplied with fresh air at the level recommended by ASHRAE 62-1989. The ventilation rates recommended by the ASHRAE standard are comparable to the rates prescribed for indoor areas in Scandinavia, Japan and Germany.[2]

Should the need for regulatory action on indoor air quality be determined by OSHA, it would be advisable to frame measures consistent with the approach of defining the performance goals desired, and allowing employers broad flexibility in how to meet these goals. This general approach has been suggested recently by Dwight Lee in a 1991 publication. In his review, Lee provides recommendations for proposed regulatory action on indoor air quality.[3] He writes:

> If political decision makers determine that indoor pollution levels are excessive in the

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absence of government action, then the goal should be to reduce that pollution to acceptable levels and to do so at least cost. Assume, for example, that the government has determined that indoor air quality in all commercial establishments, workplaces, and buildings open to the public should meet some specified standard. After the government establishes such a standard, for government policy then to impose specific abatement procedures on those responsible for indoor pollution levels would not be efficient. Instead, efficiency requires that the procedure for satisfying the indoor air quality standard be determined by those who -- as residual claimants (either private owners or public managers) -- possess the greatest information and motivation so as to satisfy that standard at least cost.

If one has the flexibility to meet indoor air quality standards at least cost, then a variety of responses surely will occur. In some cases, of course, the response will involve restricting cigarette smoking. But such restrictions will not likely be the only -- or even the most important -- means of improving indoor air quality. One can expect that restricting everything from the type of new carpet installed to the location of office supplies will play a role in reducing indoor air pollution in the most efficient manner. And in nearly all cases, restricting items and activities will be complemented -- if not eliminated -- by paying attention to installing and maintaining proper ventilation systems.

. . . if government policy established an indoor air quality standard, then no justification exists for government restrictions on smoking. To the extent restrictions on smoking are an appropriate response to the problem of indoor pollution, they will be imposed more efficiently by those with the most information and motivation to meet the indoor air quality standard at least cost.

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OSHA is urged, if the need for regulation and/or guidelines on indoor air quality is demonstrated as a result of the RFI process, to develop a comprehensive but flexible approach to total indoor air quality in the workplace. To that end and consistent with OMB Policy Directive A-119, OSHA should consider and evaluate already existing consensus standards and guidelines on indoor air quality and, in so doing, give consideration to a performance-based approach.

Ventilation Rates

OSHA may want to consider the ventilation rates currently set forth in ASHRAE Standard 62-1989 ("Ventilation for Acceptable Indoor Air Quality") as minimum ventilation rates in indoor workplace environments for new and renovated buildings. These ASHRAE ventilation rates were specifically designed to offer consensus industry standards addressing potential complaints about indoor air quality. Consistent with these guidelines, reasonable smoking in the workplace can be accommodated. In those instances where smoking lounges are utilized by an employer to assist in accommodation, ASHRAE 62-1989 currently sets forth additional ventilation rate parameters for such spaces. The current ventilation rate provisions of ASHRAE 62-1989 reflect consensus standards of experts in that field.

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HVAC Operation and Maintenance

OSHA may want to consider and evaluate an HVAC operational requirement that HVAC systems shall be operated continuously during working hours except during emergencies, repairs or in such other circumstances as identified by OSHA. A requirement for periodic inspection, maintenance and monitoring of HVAC systems may be warranted to assure proper operation, efficiency, general hygiene, and bioaerosol control. In a similar context, guidance on proper air filtration techniques and applications and guidance on proper temperature and humidity ranges may be helpful in developing a sound IAQ standard. ASHRAE Standard 52-76 (filtration) and ASHRAE Standard 55-1981 (humidity and temperature) may be of assistance to OSHA in this regard.

Design, Construction, Renovation of Buildings or HVAC Systems

Because an otherwise effective systems approach to good indoor air quality can be influenced by construction and remodeling, OSHA may want to consider requiring employers to maintain acceptable indoor air quality during periods while work is being performed on the workplace facility (e.g., remodeling, reroofing, painting and similar activities). When replacement or substantial renovation or alteration of the HVAC system is undertaken, OSHA should consider requiring that the HVAC system be updated so as to provide at least

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the minimum ASHRAE ventilation rates currently specified in ASHRAE 62-1989. Similarly, OSHA may want to consider addressing the unique indoor air problems which may be associated with new buildings being "commissioned" or occupied for the first time.

Conclusion

Scientific studies regarding indoor air quality reveal that numerous substances affect the indoor work environment and can give rise to symptoms of sick building syndrome and other complaints regarding indoor air. A common theme that runs through the literature, however, is that the principal factor associated with indoor air quality complaints is inadequate ventilation. Thus, to the extent that OSHA determines that a need exists for regulatory action, it is recommended that OSHA frame its regulations in terms of an overall performance standard which will address inadequate ventilation, rather than through efforts to control each specific substance that may be found in indoor air. To this end, the ventilation rates set forth in ASHRAE Standard 62-1989 stand as the most commonly recognized ventilation standard designed to address complaints about indoor air quality. If OSHA determines regulatory action is warranted, adoption of ventilation rates at least equivalent to those set forth in a general consensus standard like ASHRAE 62-1989 would constitute a well-reasoned approach that has been scientifically shown to improve indoor air

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quality and, at the same time, would allow employers flexibility in accommodating the wishes of their diverse workforces.

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Summary

I. Background Statement, OSHA RFI: Fed Reg. 29 CFR Part 1910: 56 (183), September 20, 1991.

Summary:

Several claims about PTS (passive tobacco smoke) which appear in the Background Statement of the OSHA RFI are not scientifically accurate and are not supported by actual data. On the contrary, actual data on exposures to PTS constituents under realistic conditions in the workplace indicate minimal exposures for nonsmokers.

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Question 2a(i): "What data are available that associate adverse health effects with exposure to chemical agents?"

Summary:

There is a large body of scientific literature which suggests that exposure to chemical agents in the indoor environment is associated with adverse health effects. Moreover, the literature suggests that exposure to chemical agents is associated with symptoms of "sick building syndrome." Reported symptoms of exposure to chemical agents include headaches, dizziness, lung function impairment, fatigue, eye, nose and throat irritation, memory difficulties, and, possibly, decreased immunity. Scientists have reported that there are possibly synergistic reactions that occur between these different chemical agents in the indoor environment. Therefore, these chemical agents may have combined effects on the health of the occupants of buildings with inadequate ventilation. Attempts to control individual sources of chemical agents in the indoor environment may not be sufficient to prevent the possible combined effects of the chemical agents. Therefore, in order to substantially reduce the risk of health complaints associated with exposure to chemical agents in the indoor air, OSHA should mandate adequate ventilation in commercial buildings.

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Question 2a(ii): "What data are available that associate adverse health effects with exposure to bioaerosols?"

Summary:

Bioaerosols, i.e., biological agents such as viruses, bacteria, fungi and their products, have been linked to a number of diseases and conditions. Such illnesses include Legionnaires' disease, hypersensitivity pneumonitis, humidifier fever, asthma, sick building syndrome and cold or influenza. The incidence of many of these illnesses has been linked to improper maintenance of ventilation systems or to inadequate levels of air exchange. For instance, the organism responsible for Legionnaires' disease, a form of severe, sometimes fatal, pneumonia, has been isolated from water in ventilation systems. Humidifiers have been implicated in the development of hypersensitivity pneumonitis, a condition that may lead to permanent lung damage. Humidifier fever, asthma and sick building syndrome are less well-understood; however, these complaints may affect worker performance. Infectious diseases (e.g., cold or influenza) are also likely to be transmitted more readily in poorly ventilated buildings.

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Question 2a(iii): "What data are available that associate adverse health effects with exposure to passive tobacco smoke?"

Summary:

Epidemiologic studies reporting an association between spousal and parental smoking and chronic disease in nonsmokers do not include actual exposure assessments of PTS. Furthermore, available data on exposure suggest that nonsmoker exposure to PTS in public places and workplaces is minimal. Among the epidemiologic studies on spousal smoking and lung cancer, only 12 have assessed reported workplace exposures to PTS; ten do not report statistically significant associations between PTS and nonsmoker lung cancer. Only five studies on PTS and heart disease address workplace exposure; not one reports a statistically significant association. Only six studies have investigated workplace PTS exposure and adult respiratory disease; their results can best be described as inconclusive. Similarly, little published data exists on PTS and conditions such as asthma or allergy in the workplace. Furthermore, all the epidemiologic studies on PTS may be criticized for problems in design and methodology and failure to account for possible confounding factors. The available data from published epidemiologic studies are not sufficient to support the claim that PTS exposure in the workplace is associated with chronic disease in nonsmokers.

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Question 2a(iv): "What data are available that associate adverse health effects with exposure to radon?"

Summary:

Radon, a naturally occurring radioactive gas, is ubiquitous in the indoor environment. Epidemiologic studies report an increased risk of lung cancer associated with the inhalation of radon and its radioactive "daughters" in underground miners. Although questions remain about radon dosimetry, it has been suggested that radon may be associated with an increased risk of lung cancer in the general population. Radon levels in buildings may be reduced with adequate ventilation.

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Question 2(d): Based on observations in your workplace or your knowledge from other sources, how much lost work time and decreased productivity may be traceable to illnesses relating to poor indoor air quality? What is the basis for your estimate?

Summary:

Several studies in the scientific literature on indoor air quality suggest that poor indoor air quality is related to lost work time and decreased productivity. Insofar as poor indoor air quality is associated with inadequate ventilation, the literature indicates that an increase in ventilation to rates specified in ASHRAE Standard 62-1989 may improve productivity and reduce absenteeism rates. The cost incurred in an increase in outdoor air ventilation is, according to these authors, offset by increased worker morale, productivity and reduced absenteeism.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 3(a): "What correlation, if any, can be made between symptoms presented and IAQ complaints and type of causative agent? For example, are certain symptoms more indicative of exposure to chemical contaminants as opposed to biological contaminants? Please give examples.

3(b): If such a correlation has been made, how effective is this information in identifying sources of contaminants?"

Summary:

Four large databases on sick-building syndrome investigations, including databases from NIOSH, Health and Welfare Canada, T.D. Sterling Ltd., and Healthy Buildings International, do not reveal significant correlations between IAQ complaints and symptoms and specific types of causative agents. In over 50 percent of all sick-building cases, symptoms and complaints are abated by increasing ventilation rates to those comparable to the rates specified in ASHRAE 62-1989. In addition, the four databases indicate that complaints and symptoms can be correlated to tobacco smoking in only two to four percent of all sick-building investigations.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 5: "In cases where IAQ investigations have identified a bioaerosol as the etiologic cause of a building-related illness:

(a) Did complaints occur within a specific length of time?

(b) Were there similarities in symptoms among affected individuals which suggested exposure to a specific agent, e.g., Legionella pneumophila? Was the etiological agent identified?

(c) What laboratory tests were performed to confirm that a specific bioaerosol was responsible for health complaints?

(d) How was the problem resolved?"

Summary:

A review of some published case studies of health effects related to biological contamination of the indoor environment provides some insight into the process of identifying specific biological agents related to those health effects. Outbreaks of various diseases and illnesses have been correlated with improper maintenance or operation of ventilation systems, suggesting that proper maintenance and operation could reduce the incidence of bioaerosol-related illness. Specifically, the presence of Legionella, the causative agent of both Legionnaires' disease and Pontiac fever, has been noted in cooling towers and water systems. Microbial contamination of humidifiers and of previously flooded areas has been associated with humidifier fever and hypersensitivity pneumonitis.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 6: "IAQ investigations conducted by NIOSH indicate that some type of biological contaminant was involved in five percent of the cases.

(a) Are there other data available which indicate the prevalence of biological contaminants as the cause of adverse health effects?

(b) Are data available which indicate the likelihood that health complaints are related to a specific bioaerosol contaminant? If so, please indicate the source of such data."

Summary:

Publicly available statistics indicate that a substantial portion (around 40%) of buildings may have biological contamination. Some 8-10% of pneumonia cases in the United States may be due to Legionella, a bacterium often found in water-containing components of ventilation systems. Large numbers of individuals may experience symptoms of asthma or sick building syndrome, or may become ill with colds or flu; such conditions affect their ability to work and result in health care and other costs. For instance, some researchers estimate that overall costs related to respiratory illnesses in the United States may reach into the billions of dollars. Bioaerosol contamination of ventilation systems and subsequent illness among exposed persons is thus a major concern.

2024695886

Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 7: "Persons with underlying health problems or chemical sensitivities often cannot work in industries where physical strength and endurance or exposure to chemicals occur in the normal job experience.

(a) Is there evidence to suggest that these persons are more susceptible to developing health effects due to short-term exposure to PTS, such as eye and respiratory irritation?

(b) Is there evidence to suggest that these persons are more susceptible to developing health effects due to long-term exposure to PTS, such as cardiovascular disease and lung cancer?"

Summary:

There is a growing controversy in the medical community over whether there is a physiological condition known as multiple chemical sensitivity (MCS). Most conventional physicians and the new "clinical ecologists" disagree on the origins of the alleged sensitivities. Conventional physicians, in general, appear to believe that the condition may be of a psychological origin. We are unaware of any original data on whether people allegedly afflicted with MCS are at increased risk of long term health effects associated with exposure to various indoor air constituents. There are reports in the scientific literature, however, that people reportedly afflicted with MCS are more reactive and sensitive to short-term exposures to a wide range of indoor air constituents, outdoor air constituents, food additives and water contaminants. Authors of various studies have reported that adequate ventilation and focusing on indoor air in its entirety will help avoid future cases of MCS allegedly due to tight-building syndrome.

2024695887

Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 8: "Some people may develop an increased sensitivity to chemical pollutants, such as found in PTS, during pregnancy or treatment with certain medications (Calabrese 1978). What additional studies pertain to this sensitivity?"

Summary:

Calabrese suggested that pregnant women and people on certain medications may develop an increased sensitivity to a wide-range of chemical substances. We are unaware of any other scientific studies regarding these alleged sensitivities. Contrary to the OSHA RFI, Calabrese does not appear to implicate PTS per se as a specific potential cause of these sensitivities. The author stated that cadmium, lead, manganese, carbon monoxide, organophosphate insecticides, beryllium, fluoride, nitrogen dioxide, sulfur dioxide and ozone may potentially be associated with sensitivity reactions in some individuals. Although a few of these chemicals are reportedly found in cigarette smoke, there are numerous potential sources of these chemicals in the indoor environment. It would seem appropriate to focus on all potential sources of these chemicals rather than on one potential source. Therefore, ensuring adequate ventilation of the working environment appears to be the logical solution.

2024695888

Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 12: "To your knowledge, have PTS exposures been associated with specific adverse health endpoints in experimental animals."

Summary:

Animal inhalation experiments using fresh sidestream smoke or constituents of sidestream smoke do not support the claim that PTS is a pulmonary carcinogen. Two such experiments have been published; both reported no meaningful differences in the lung tissue of animals exposed to sidestream smoke and those not exposed to smoke. In addition, recent reviews of the literature on suspected pulmonary carcinogens have concluded that none of the individual constituents in sidestream smoke which are classified as potentially carcinogenic have been found to induce pulmonary cancer via inhalation in experimental animals.

Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 13(a): Have these factors been considered in instances where IAQ investigations have failed to identify a specific contaminant source?

Question 13(b): If yes, was remedial action taken to improve these conditions? Please explain what that action was.

Question 13(c): Did health complaints decline?:

Summary:

Sick-building investigation databases indicate the important role of so-called physical stressors such as temperature, lighting, noise, and ergonomics in perceived worker satisfaction with the working environment. Job satisfaction, security, and type of work also are important factors in perceived worker comfort. Tobacco smoke, because it is visible and easily identifiable, is often identified as a "stressor" in the work environment. However, investigations reveal that reported complaints about tobacco smoke may be misdirected and the result of less obvious conditions such as lack of ventilation (stuffy air), high temperatures, inadequate lighting, overcrowding and uncomfortable working conditions. Increased outdoor ventilation, as well as adequate temperature and humidity control, have resulted in a decrease in worker complaints about IAQ.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 17: "Dust mite infestations in indoor environments are implicated as a cause of allergic reactions and exacerbation of asthma. Recognized as a significant problem in residences, such infestations may be associated with similar complaints in occupational settings."

Summary:

The presence of dust mites appears to be strongly related to allergies. Although the majority of published literature focuses on mites in homes, there is some indication that dust mites may be a problem in the workplace. If so, proper humidification and carpet cleaning could be used to limit mite levels.

2024695891

Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 18: "What correlation, if any, can be made between the number of cfu per cubic meter of air and the potential to cause adverse health effects in susceptible individuals exposed to such contaminants?"

Summary:

Elevated fungal levels have been associated with reports of various respiratory and allergic symptoms, according to published literature. Proper maintenance of ventilation systems and sufficient ventilation may help to reduce fungal levels.

2024695892

Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 19: "What data, if any, are available that suggest that the effects of bioaerosols are influenced by seasonal changes?"

Summary:

Biological contaminants such as fungi and bacteria (e.g., Legionella) which accumulate in improperly maintained HVAC systems seem to show some seasonal variability in abundance. Nevertheless, year-round levels indoors may remain elevated due to inadequate ventilation and/or system maintenance.

2024695893

Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 24: "Current IAQ investigations indicate that ambient levels for specific substances are typically found to be within occupational exposure limits."

24(a): "If your workplace has conducted air monitoring for specific substances, why was such sampling done?"

24(b): "For what substances did you monitor?"

24(c): "What were the concentrations for each substance?"

24(d): "What types of instruments were used in conducting the sampling?"

Summary:

Of the many substances detectable in indoor air, PTS constituents have been monitored with greatest frequency. Typical markers for PTS exposures include carbon monoxide, nicotine, particulates, and lately, VOCs. Monitoring under typical, realistic conditions in public places, restaurants and workplaces indicates that carbon monoxide and volatile organics in indoor atmospheres are not significantly different in areas where smoking is allowed compared to areas where smoking is not permitted. Smoking and nonsmoking areas can be distinguished by nicotine levels, although reported nicotine levels in smoking areas are many times below the occupational exposure limits and, for nonsmoking areas, are often below levels of detection for nicotine monitors. A recent method has been developed to discern particulate contributions from PTS as opposed to non-PTS derived particulate contributions. This method employs the use of ultraviolet wavelengths to determine particulate constituents from PTS. The method indicates that under realistic conditions, PTS contributes approximately 20 to 35 percent of the total respirable particulates in indoor areas.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 25(a): "Specifically, carbon dioxide at levels of 800 to 1,000 ppm has been a traditional indicator of poor indoor air quality due to poor air exchange. Have you conducted any carbon dioxide monitoring?

(b) If so, what concentrations were found?"

Summary:

The scientific literature suggests that investigations in several commercial buildings have reported levels of CO_2 that are potentially associated with adverse health complaints from occupants due to poor air exchange.

2024695895

Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 26(a): "Is there any evidence to suggest that IAQ complaints coincide with specific amounts of specific volatile organic chemicals (VOCs) in air (e.g. formaldehyde)? That is, can VOCs in mg/m^3 be used as a measure of IAQ?"

Summary:

There is evidence to suggest that health complaints are associated with specific levels of VOCs in the indoor environment. Researchers from Canada have indicated that total VOC levels can provide a useful indicator in assessing indoor air quality. Other researchers disagree, claiming that total VOC levels are not as useful as measures of individual VOC levels in assessing indoor air quality. Researchers do appear to agree, however, that specific VOC levels are associated with specific health complaints from occupants of buildings with inadequate ventilation.

2024695896

Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 26(b): "Are there practical sampling methods available for estimating total VOCs in air?"

Summary:

The scientific literature suggests that there are several practical sampling methods available for estimating total VOCs in indoor air. The majority of studies detail methods of tracing specific emissions, or "off-gassing," of VOCs from various sources, such as particle board. However, other studies describe techniques for measuring total VOC levels in the indoor environment. While the specific methodology used to obtain samples varies from study to study, gas chromatography-mass spectrometry seems to be used consistently for the analysis of the samples obtained.

2024695897

Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 33 (a): "If you suspect bioaerosol contamination, what sampling techniques do you use to determine the presence or concentration of such contaminants?

(b) What have been the results?

(c) Were any remedial actions necessary?

(d) If so, what actions did you take?

(e) Did you resample following the initial actions?

(f) Did it make a difference?"

Summary:

Sampling for biological contaminants involves considerable effort and care. Employee complaints, physician recommendations or visual evidence of contamination may suggest the need for sampling. Furthermore, complaints or evidence of contamination should suggest attention to the amount of fresh air provided or to the maintenance of the ventilation system. In situations of identified bioaerosol contamination, remediation often involves clean-up and disinfection. More importantly, scientists believe that proper design, operation and maintenance of heating, ventilating and air conditioning systems may reduce the opportunity for contamination in the first place. Proper filtration, humidification and ventilation are all components of preventive maintenance that are key to limiting biological contamination in buildings.

2024695898

Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 35(a): "Is information available on the concentration of PTS components, such as nicotine and particulate matter, detected in the air of indoor work places?

Question 35(b): If you know of such information, please provide available references."

Summary:

Published studies indicate that nonsmoker exposure to PTS constituents under normal, everyday conditions is minimal. For example, researchers report that there is little difference in ambient levels of carbon monoxide (CO) in smoking and nonsmoking areas of workplaces and other public places and in homes with and without smokers. Other studies indicate that ETS contributes about 25-35% of the total particles in the air of an average public place. Typical measurements of nicotine, which is used as a marker for ETS exposures because it is unique to tobacco smoke, range from an exposure equivalent of one one-hundredth (1/100) to less than one one-thousandth (1/1000) of a filter cigarette per hour.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 36: "Are data available that demonstrate specific ranges of concentrations of cotinine or other biomarkers and biological tissues that are associated with specific levels of exposure to nicotine in PTS?"

Summary:

Published research on cotinine indicates that direct correlations between exposure to nicotine in the ambient air and the existence of cotinine in body fluids are not consistent. Researchers have reported that individuals metabolize nicotine in different ways at different times and that elimination rates for cotinine will vary among individuals. Diet may contribute to levels of nicotine and cotinine found in the body thereby interfering with ambient air exposure levels. Scientists have also noted that different methods of analyses may influence final reported levels of cotinine. For these reasons cotinine is not a reliable quantitative measure of PTS exposure.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 37(a): "What is the relationship between inhaled nicotine and cotinine levels in body fluids?"

37(b): "How does this relationship differ for smokers versus nonsmokers?"

Summary:

Relationships between inhaled nicotine and cotinine levels in body fluids, according to published research, vary greatly due to inter-individual and intra-individual variations in metabolism and clearance of nicotine and cotinine. Moreover, data indicate that inter-individual variability exists for measurements of nicotine and cotinine in saliva, blood plasma and urine.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 38: "Are there identifiable biological markers for cumulative exposure which would facilitate investigation of chronic diseases associated with exposure to PTS?

Summary:

Other biological markers have been suggested in the literature for determining cumulative exposure to PTS. Those markers include mutagens, polycyclic aromatic hydrocarbons, hydroxyproline and DNA adducts. None of these proposed biological markers satisfies the requirements for assessing cumulative exposure to PTS. The literature reports that non-smokers who are exposed to realistic levels of PTS, when compared to non-smokers who are not so exposed, exhibit no significant increases in body fluid levels of the various proposed biological markers.

2024695902

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 39(a): "In workplaces where a restricted smoking policy has been implemented, has monitoring and evaluation been performed to determine its effectiveness in reducing levels of PTS components?"

39(b) "If so, what substances are monitored?"

Summary:

A number of published studies in the scientific literature have reported levels of PTS constituents under conditions of restricted smoking policies. Such studies indicate that simple separation of smokers and non-smokers, even under conditions of recirculation, typically reduces non-smoker exposure to PTS constituents by as much as 90%. Constituent levels monitored in non-smoking areas under restricted conditions are often below the level of detection for monitors of PTS constituents.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 40: "Have you ever monitored for radon in your workplace?"

Summary:

Radon may accumulate in improperly ventilated structures. To assess its levels, two types of samplers may be used. Passive samplers remain in the building for several months and give an average radon level over time. Active samplers require only a few minutes to estimate radon at that one point in time.

2024695904

Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 43: "Do you have evidence to show that overcrowding is a source of bioaerosol formation?"

Summary:

Published case studies suggest that overcrowding, particularly under conditions of poor ventilation, may favor the transmission of disease. For instance, when researchers compared the incidence of respiratory diseases in Army trainees living in energy-efficient new barracks vs. old barracks with more fresh-air intake, statistically significantly higher rates were found in the new barracks. Similarly, a severe outbreak of influenza occurred when a number of airline passengers were confined to a plane with the ventilation system turned off. While spatial considerations are important in minimizing certain workplace health problems, adequate ventilation should also be considered.

2024695905

Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 45: "Is it part of your company's or building owner's policy to follow the ASHRAE Standard 62-1989 regarding the introduction of fresh outdoor air into the ventilation system?"

Summary:

The three major building code organizations in the U.S. are currently considering the adoption of ASHRAE 62-1989 into their respective codes. If so incorporated, municipal and local governments in the U.S. will then adopt the Standard as part of their governing building code. ASHRAE 62-1989 would then serve as the design standard for ventilation for all new and retrofitted buildings. Moreover, many of the published reports on sick-building investigations recommend compliance with ventilation rates comparable to ASHRAE 62-1989 for remediation of inadequate ventilation and complaints about poor indoor air quality.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 46: "If the answer to question 45 is yes, do you consider the specific type of work environment in determining the appropriate quantity of fresh air to introduce? For example, the ASHRAE recommended level for smoking lounges is 60 Cubic Feet per Minute per person (CFM/person) as opposed to 20 CFM/person for regular office space."

Summary:

Although workplace configurations will vary greatly, the ventilation rates recommended in ASHRAE 62-1989 were developed in order to "control CO_2 and other contaminants with an adequate margin of safety and to account for health variations among people, varied activity levels, and a moderate amount of smoking." The minimum ventilation rates specified in ASHRAE 62-1989 are rates which should be applied to all areas in order to maintain acceptable indoor air quality.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 47(a): If you do not follow the ASHRAE guidelines do you believe one minimum acceptable CFM/person threshold exists for all indoor work environments which would successfully alleviate all health effects?

Question 47(b): What would you recommend that level to be? Please provide supporting information.

Summary:

Whether or not exposures to various substances in indoor (non-industrial) work environments are associated with acute symptoms and chronic disease is currently under investigation by the scientific community. No conclusive scientific data exist to support the claim that a certain ventilation level "would successfully alleviate all health effects." However, the ventilation rates and IAQ procedures specified in ASHRAE 62-1989 were designed to address complaints about IAQ and health effects. [The Standard specifies a minimum ventilation rate of 15-20 cfm in most indoor areas, including offices.] Compliance with the Standard has reduced the number and frequency of complaints and symptoms in sick-buildings, and provides a minimum standard for acceptable indoor air quality in the workplace.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 48: "What data are available correlating PTS concentrations to ventilation rates and density of smokers?"

Summary:

Few studies in the published literature report measurements of PTS, density of smokers, and ventilation rates. However, studies on ETS exposure determine PTS constituent levels in conjunction with information on the number of smokers present or the number of cigarettes smoked. The revised ASHRAE Standard (62-1989) recommends a ventilation rate of 20 cubic feet of outside air per minute (cfm) per person for most commercial (office) facilities, with 15 cfm as the minimum. The Standard's drafters concluded that a minimum ventilation rate of 15 cfm/occupant will produce air quality that is acceptable to 70 percent of visitors and to 90 percent of adapted occupants, assuming a moderate amount of smoking (30% smoking, 1.7 cigarettes/hour/smoker).

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 49: "If you believe there is an acceptable level of passive tobacco smoke in indoor air, how would you maintain this level in your building? What ventilation rate would be appropriate to solve this PTS problem?"

Summary:

The Chairman of ASHRAE Standards Project Committee 62-1989 stated, in recent Congressional testimony, that the amount of ventilation determined in the Standard was "found sufficient to control tobacco smoke odor when the smoking rate is about today's average." In addition, the Standard has been evaluated for its efficiency in dispersion of tobacco smoke by a number of researchers.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 50(a): Have you found that redesigning the workplace interior (e.g., as in renovation), leaving the ventilation system alone results in improper distribution of air?

Question 50(b): If so, what types of problems ensue after the remodeling?

Summary:

Redesign of a workplace interior may result in displacement of supply and return air openings and ducts. It is therefore prudent on the part of any workplace manager to consult ASHRAE guidelines and local building codes during the process of renovation for a determination of the adequacy of a ventilation system.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 51: ASHRAE set its recommendations assuming 100% fresh outdoor air introduction, but states that properly filtered, recirculated air at the same flow rates will adequately remove contaminants to acceptable levels.

Question 51(a): Do you agree with this statement?

Question 51(b): If yes, please provide information which supports recirculating filtered air as a healthy alternative to 100% fresh air introduction.

Question 51(c): If not, what types of problems are associated with recirculated air?

Summary:

ASHRAE Standard 62-1989 permits the use of recirculated air if the air is properly cleaned and filtered. The extent to which a filtration system will remove both gaseous and particulate substances [equivalent to the dilution of those substances by fresh outdoor air] will depend upon the manufacturers specifications for the filtration units, as well as active maintenance procedures. Poor maintenance of filtration systems can result in degradation of indoor air quality and an increase in occupant complaints.

2024695912

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 54: "Is it possible to mitigate IAQ problems due to bioaerosol contamination just by properly maintaining the ventilation systems in respect to microbial growth, fungal growth, etc.?"

Summary:

There are two aspects to mitigating IAQ problems related to bioaerosol contamination. Proper operation and maintenance of ventilation systems is important in minimizing opportunities for biological contaminants to accumulate. For instance, Legionella, the bacterium responsible for Legionnaires' disease, is often found in standing water in ventilation systems. Air-conditioner ducts have also been found to contain molds and other fungi, which may cause allergic symptoms in exposed persons. Moreover, an adequate supply of fresh air, i.e., proper ventilation, can also control bioaerosol levels, as well as remove other components that contribute to indoor air quality. Particularly, some poorly-defined complaints like sick building syndrome have reportedly decreased following improved ventilation.

2024695913

Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 61: If you use smoke reduction methods:

Question 61(a): What types do you use?

Question 61(b): What is the yearly cost of the program (1) per employee and (2) per cubic foot of workplace space?

Summary:

The most widely reported method for maintaining acceptable indoor air quality in both smoking and nonsmoking areas is compliance with the ventilation rates specified in ASHRAE Standard 62-1989. The effectiveness of the Standard is supported by scientific data in the published literature.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 62: "If smoking is allowed in indoor work areas, what should be done to assure that nonsmokers are protected from exposure to PTS?"

Summary:

The U.S. Surgeon General, in his 1986 Report on "Involuntary Smoking," claimed that simple separation of smokers and nonsmokers did not effectively minimize nonsmoker exposure to PTS. However, this claim was not supported by scientific data. A number of studies in the published literature indicate that simple separation of smokers and nonsmokers effectively minimizes nonsmoker exposure to PTS, even under conditions of recirculation. Moreover, other research indicates that ventilation at levels recommended by ASHRAE Standard 62-1989 is sufficient to maintain acceptable indoor air quality under conditions, defined by ASHRAE, of "moderate" smoking.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 63: "In your opinion, should smoking control policies differ for different types of workplaces (e.g. factories, offices, stores, restaurants)? If your answer is yes, please state your reasons why you believe this."

Summary:

Yes; workplace environments are infinitely varied and smoking policies need to be designed to fit the requirements of individual workplaces. In certain environments it may be unnecessary to make changes. (For example, ventilation may be adequate or employees may not work in close proximity to each other, etc.) In others, minimal changes may sensibly accommodate the interests of all. In addition, employers are entitled to and should give due accommodation to the interests of both smokers and nonsmokers.

2024695916

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 64(b): "Has monitoring ever been conducted to determine the transfer of smoke constituents from the designated smoking areas to nonsmoking areas? If so, can you supply the results of them."

Summary:

The published literature on PTS exposures contains data regarding the low levels of PTS constituents "transferred" from designated smoking areas to nonsmoking areas, including conditions involving a shared ventilation (recirculation) system.

2024695917

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 65: "In companies that allow smoking throughout the workplace, describe what, if anything, is done to reduce nonsmoker's exposure to PTS?"

Summary:

Adequately ventilated workplaces in which smoking is permitted may require no additional actions to minimize nonsmoker exposure to PTS. Complaints about PTS typically have been addressed by employers with one or more of the following options: (1) increasing outdoor air ventilation to the levels specified in ASHRAE Standard 62-1989; (2) relocation of a workstation; (3) grouping of smokers and nonsmokers; (4) partitions in "open" office settings; (5) use of desk top air cleaners or "smokeless ashtrays" for smokers. These measures can be effective in addressing complaints about PTS and would require few additional costs to the employer. These remedies are based on the concept of accommodation of both smoker and nonsmoker interests, and the belief that cooperation, courtesy and respect between smokers and nonsmokers can be fostered in the workplace.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 66(a): "In your experience or opinion, is it feasible to reduce PTS contaminant levels to adequate levels just by increasing ventilation?"

Question 66(b): "If so, are costs in equipment and maintenance any different than those required for maintaining good indoor air quality?"

Summary:

The effectiveness of ASHRAE Standard 62-1989 for dilution of PTS constituents has been evaluated by scientists. In 1990, researchers presented results of their work comparing the effects of increased ventilation recommended by ASHRAE 62-1989 in areas where smoking is permitted and in areas where it is prohibited. Through the aid of computer models, the researchers demonstrated that the quality of air in areas where smoking is permitted does not differ significantly from the quality of air in nonsmoking areas, where both areas are supplied with fresh air at the level recommended by ASHRAE 62-1989. It is therefore feasible, according to the published literature, to "reduce PTS concentrations by ventilation." Insofar as ASHRAE 62-1989 is a ventilation standard designed to address all indoor air quality issues, imputed "costs in equipment and maintenance" for PTS dilution and removal should not differ appreciably from the costs required to maintain overall indoor air quality.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 67: (a) "Is it necessary to use separate ventilation in smoking areas to reduce the possibility of cross-contamination during air recirculation from smoking areas to nonsmoking areas?" (b) "If not, explain why cross contamination of recirculated air is not a problem?"

Summary:

(a) No; Numerous reports in the published literature contradict the above contention. Separately ventilated smoking areas are not required to effectively minimize nonsmoker exposure to PTS.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 68(a): "In smoking areas, what types of commercial room air cleaners (e.g. desk top air cleaners, ionizers) other than ventilation are used to reduce levels of PTS?"

68(b): "How do you know they are effective in removing smoke from the air?"

68(c): "List other commercial air cleaners which are effective in removing PTS-related gases and particulates from the ambient air."

Summary:

Although a number of commercially available room air cleaners exist, we have not evaluated the effectiveness of these systems.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 71: (a) "If you believe that OSHA should adopt the ASHRAE Standards for controlling occupational exposures to indoor air contaminants, please provide any quantitative information you have to support their effectiveness in improving air quality."

Summary:

Scientific data support the effectiveness of ASHRAE Standard 62-1989 for improvement of indoor air quality. The ventilation rates recommended by the Standard are comparable to rates prescribed for indoor areas in Scandinavia, Japan and Germany. The ASHRAE Standard was specifically designed to "control carbon dioxide and other contaminants with an adequate margin of safety, and to account for variations among people, varied activity levels, and a moderate amount of smoking." The available published scientific literature supports this conclusion.

2024695922

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 72: "Please estimate what you believe the capital costs would be of incorporating the ASHRAE Standard into your building's design and how doing so would affect the cost of renovation projects."

Summary:

An earlier version of the ASHRAE Standard, ASHRAE 62-1973, specified a minimum recommended ventilation rate of 15 cfm/person. The Standard was incorporated into building codes and was in effect throughout the 1980's. Thus, differences in design specifications between the 1973 and 1989 versions of the ASHRAE Standard are not likely to be significant and may, in fact, be identical for certain indoor areas.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 73: "How effective have modifications in ventilation systems and IAQ monitoring been in reducing the number of related illnesses and complaints in your workplace?"

Summary:

Recommendations for modifications of ventilation systems by a number of sick building investigators have resulted in a reduction in the number of health related complaints and symptoms in various workplaces.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 75(a): "What type of costs (e.g., capital, operating or maintenance costs) have been involved with voluntarily adopting or changing indoor air quality, including smoking, policies?"

Summary:

Increased costs associated with the voluntary adoption of ASHRAE 62-1989 will vary according to specific workplace configurations. Capital costs are not likely to be appreciably higher than those specified by ASHRAE 62-73. Energy costs associated with operation of ventilation systems in compliance with the recommendations in ASHRAE 62-1989 are expected to increase 2% to 7% over current annual energy budgets for buildings, depending upon the location of the building. Maintenance costs should not vary appreciably from costs incurred through compliance with ASHRAE 62-73.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 75(b): "Have there been any cost savings (e.g. maintenance, insurance, productivity)?"

Summary:

The claims that maintenance, insurance and productivity cost savings may be incurred through the voluntary adoption of a smoking control policy are not supported by conclusive scientific data.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 76(a): How have personnel relationships been affected by workplace policies related to indoor air quality, especially smoking?

Question 76(b): Have there been any quantifiable benefits in this area related to the implementation of new indoor air quality policies?

Summary:

Smoking control policies may be divisive if they are not carried out in the spirit of cooperation and accommodation of both smoker and nonsmoker preferences. An efficient mechanism for potential conflict resolution also minimizes adverse effects upon worker morale.

The NIOSH database on sick building syndrome reveals that smoking is directly related to complaints in only 2% of the buildings investigated. This result underscores the importance of a comprehensive approach to achieving acceptable indoor air quality, one which is generally achieved through adequate ventilation and proper maintenance of ventilation equipment. This approach, exemplified by the effectiveness of ASHRAE Standard 62-1989, has resulted in a reduction of complaints about IAQ.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 78: "In your opinion or from your experience, are there specific workplaces where it would not be feasible to comply with a standard that consists of any of the following:

(a) smoking in designated areas only;

(b) smoking in a designated area with separate ventilation;

(c) limited exposure to specific levels of PTS components, or;

(d) a total ban in indoor work areas?"

Summary:

Workplace environments are infinitely varied and smoking policies therefore need to be designed to fit the requirements of individual workplaces. The question of "feasibility" ought to be determined on an individual, case-by-case basis. In certain workplaces, it may be unnecessary to mandate any change in current employer smoking policies. In others, minimal changes may sensibly accommodate the interests of the employer, smokers and nonsmokers.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 85a: "If, as a result of monitoring for radon, you determined that action was required to reduce the level, what action was taken?"

Summary:

While several methods of remediation for radon exist (e.g., proper choice of building materials, filter use), adequate ventilation is often cited in the scientific literature as an important means of controlling radon levels. Although many of these studies have been done in homes, several researchers have reported that the patterns of radon distribution they measured in commercial and high-rise buildings were best explained by differences in ventilation. Furthermore, adequate ventilation removes not only radon, but other air components as well, contributing to an overall improvement in indoor air quality.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 88: "OSHA requests that copies of state or local smoking rules, regulations, or guidelines be submitted. (a) Why were certain types of workplaces included in the above but other omitted? (b) Please identify sections of this rule, regulation, or guideline that are different for certain types of employers or conditions of employment (e.g., restaurants, private offices, and factories) as compared to others (e.g., general office space and public space). (c) Are structural changes in the ventilation system or the building of barriers between smoking and nonsmoking sections ever a specified option for employers in attempting to comply with the rule, regulation, or guideline?"

Summary:

Smoking rules and regulations can be conveniently categorized as "least intrusive," "partially intrusive" and "most intrusive." Recommendations for physical barriers and buffer zones between smoking and nonsmoking employees typically have been recommended under the category of "partially intrusive" laws. Structural changes in ventilation systems are rarely, if ever, mandated by a smoking regulation. Such structural changes would be regulated by local building codes.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

Question 89: "Have there been any difficulties in implementing, monitoring, enforcing and evaluating the effectiveness of these rules, regulations, or guidelines in reducing exposure of nonsmokers to PTS?"

Summary:

Cumbersome and/or intrusive regulations regarding smoking in the workplace may generate difficulties in implementation and enforcement. A policy may be a divisive element between smoking and nonsmoking employees. In addition, some employers have implemented policies which prohibit smoking away from the workplace. However, OSHA should be aware that a number of states have enacted legislation which prohibit such discrimination against smokers.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

For Redraft by Pat Tyson

Question (92) If OSHA determines, on the basis of adequate evidence, that regulatory action is needed to protect employees from adverse health effects related to indoor air quality, what elements do you believe such regulation should include? Please provide the basis for your suggested element(s).

Reply:

The scientific data cited in our foregoing response on exposure to PTS in the workplace, the minor role of PTS in "sick-building syndrome" and the efficacy of ventilation for maintenance of acceptable indoor air quality in general, including the dilution and removal of PTS constituents, suggests that a focus on PTS to address the problem of poor indoor air quality is misdirected. If policy action is directed solely against smoking, the general issue of poor indoor air quality will not be addressed.

In a review of the social costs imputed to smoking, Dwight Lee provides recommendations for proposed regulatory action on indoor air quality.[1] He writes:

> If political decision makers determine that indoor pollution levels are excessive in the absence of government action, then the goal should be to reduce that pollution to acceptable levels and to do so at least cost. Assume, for example, that the government has determined that indoor air quality in all commercial establishments, workplaces, and buildings open to the public should meet some specified standard. After the government establishes

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

such a standard, for government policy then to impose specific abatement procedures on those responsible for indoor pollution levels would not be efficient. Instead, efficiency requires that the procedure for satisfying the indoor air quality standard be determined by those who -- as residual claimants (either private owners or public managers) -- possess the greatest information and motivation so as to satisfy that standard at least cost.

If one has the flexibility to meet indoor air quality standards at least cost, then a variety of responses surely will occur. In some cases, of course, the response will involve restricting cigarette smoking. But such restrictions will not likely be the only -- or even the most important -- means of improving indoor air quality. One can expect that restricting everything from the type of new carpet installed to the location of office supplies will play a role in reducing indoor air pollution in the most efficient manner. And in nearly all cases, restricting items and activities will be complemented -- if not eliminated -- by paying attention to installing and maintaining proper ventilation systems.

. . . if government policy established an indoor air quality standard, then no justification exists for government restrictions on smoking. To the extent restrictions on smoking are an appropriate response to the problem of indoor pollution, they will be imposed more efficiently by those with the most information and motivation to meet the indoor air quality standard at least cost.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000

REFERENCES

1. Lee, D. "Environmental Economics and the Social Cost of Smoking," Contemporary Policy Issues 9(1): 83-92, 1991.

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Source: https://www.industrydocuments.ucsf.edu/docs/yzvj0000